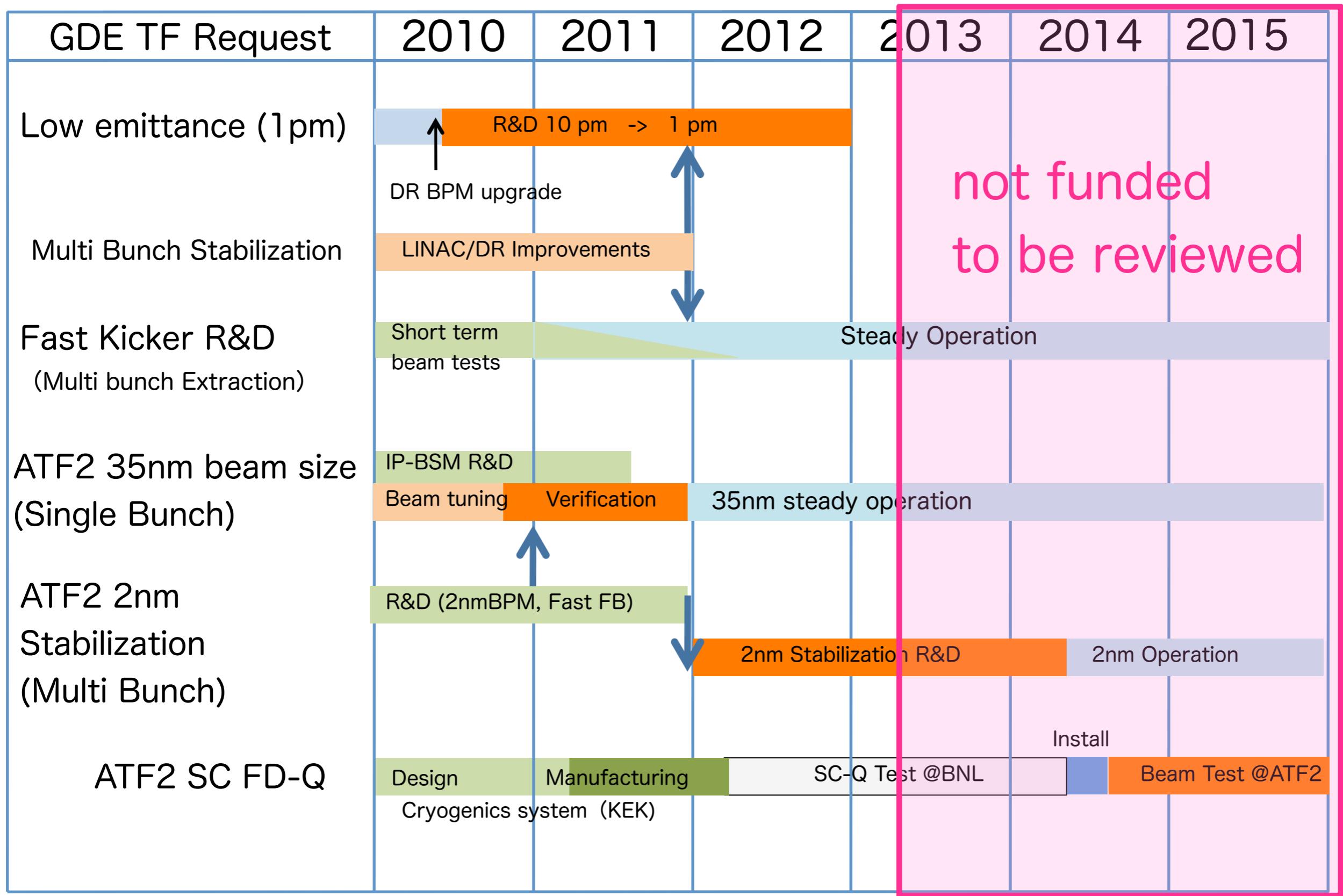


Present Status of ATF2

since ILC PAC, 11-12 November 2010

T. Tauchi,
ILC PAC, 19 -20 May 2011,
Academia Sinica, Taipei, Taiwan

ATF long term plan



2010 Autumn/Winter Run

ILC PAC

7 2010							8 2010							9 2010							10 2010							11 2010							12 2010								
Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa		
1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9	10	11	12	13	1	2	3	4	5	6	7	1	2	3	4	5	6	7			
8	9	10	11	12	13	14	15	16	17	18	19	20	21	12	13	14	15	16	17	18	10	11	12	13	14	15	16	7	8	9	10	11	12	13	5	6	7	8	9	10	11		
15	16	17	18	19	20	21	22	23	24	25	26	27	28	19	20	21	22	23	24	25	17	18	19	20	21	22	23	14	15	16	17	18	19	20	12	13	14	15	16	17	18		
22	23	24	25	26	27	28	29	30	31	29	30	31		26	27	28	29	30		31	24	25	26	27	28	29	30	28	29	30	26	27	28	29	30	31	19	20	21	22	23	24	25

Beam operation: 7 weeks

- Fast kicker mode ... 2 weeks
- ATF2 continuous run ... 1 week

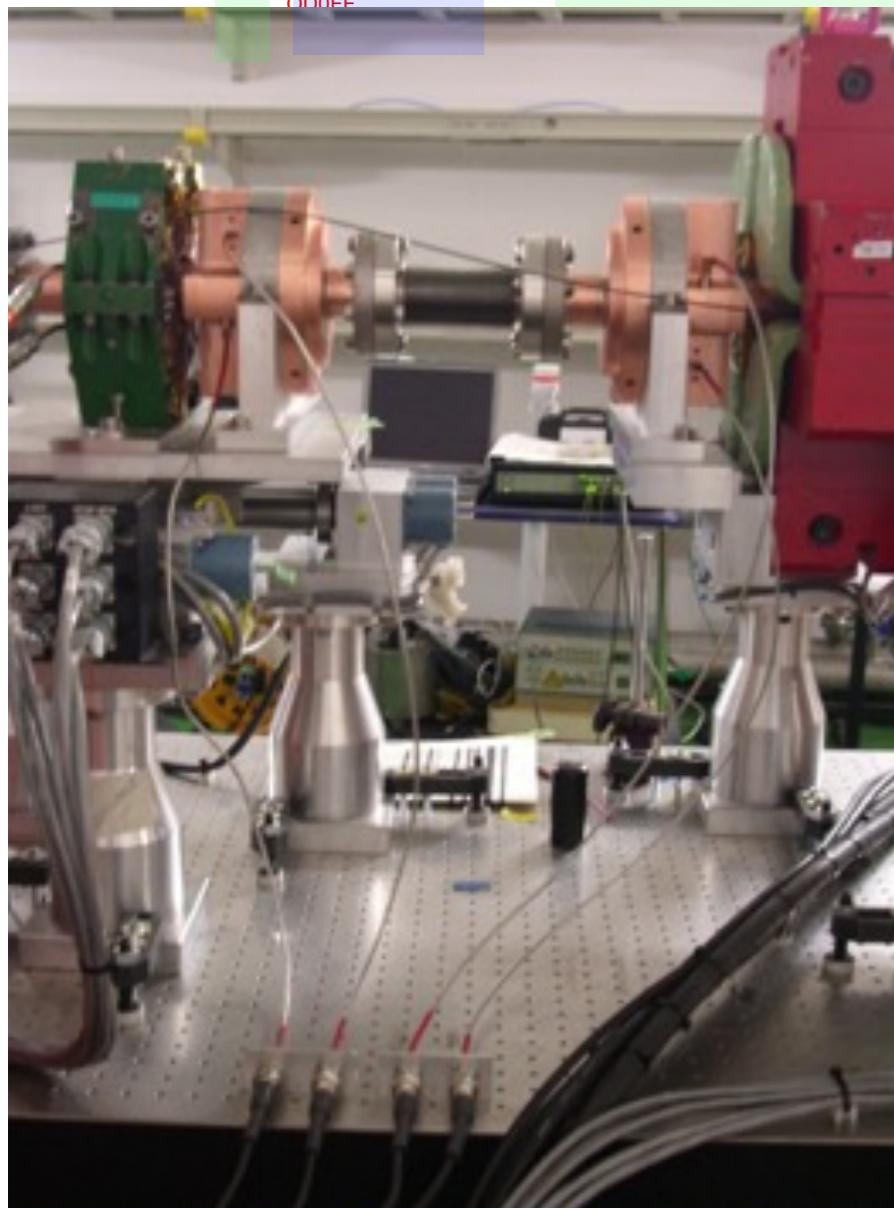
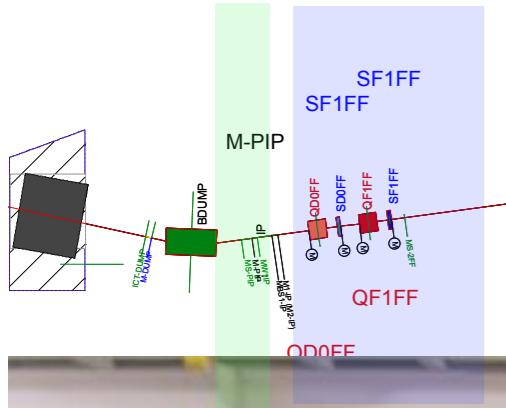
13 - 17 December 2010

Nominal optics ($\beta^*_{x/y}=1\text{cm}/0.1\text{mm}$) was set since this November, while the previous one has been the 10 times optics ($\beta^*_{x/y}=4\text{cm}/1\text{mm}$).

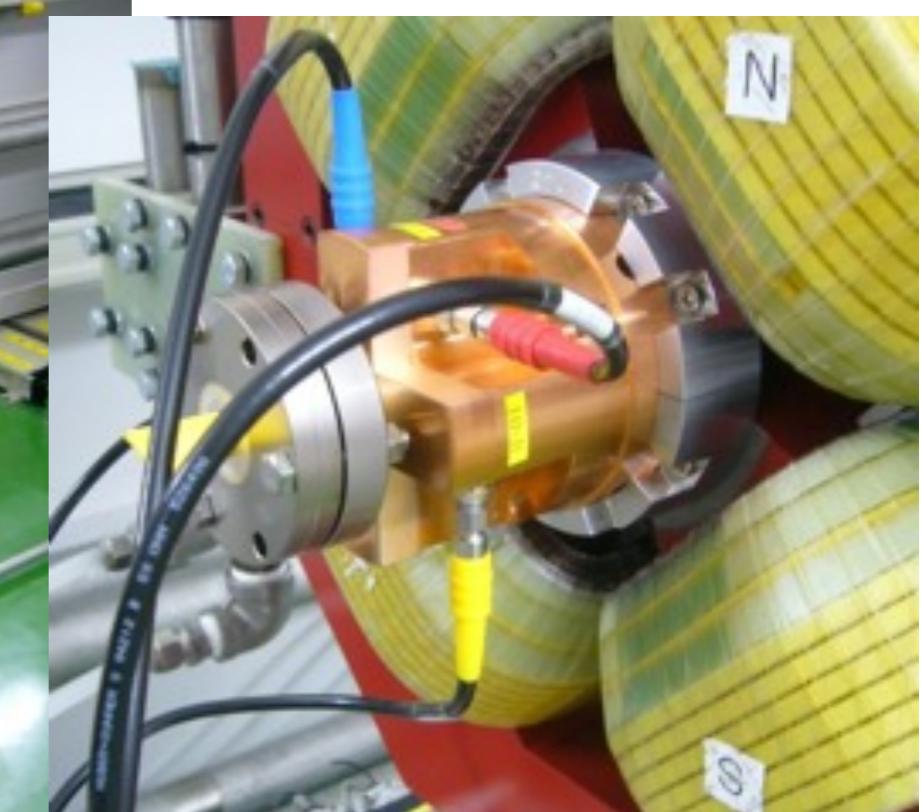
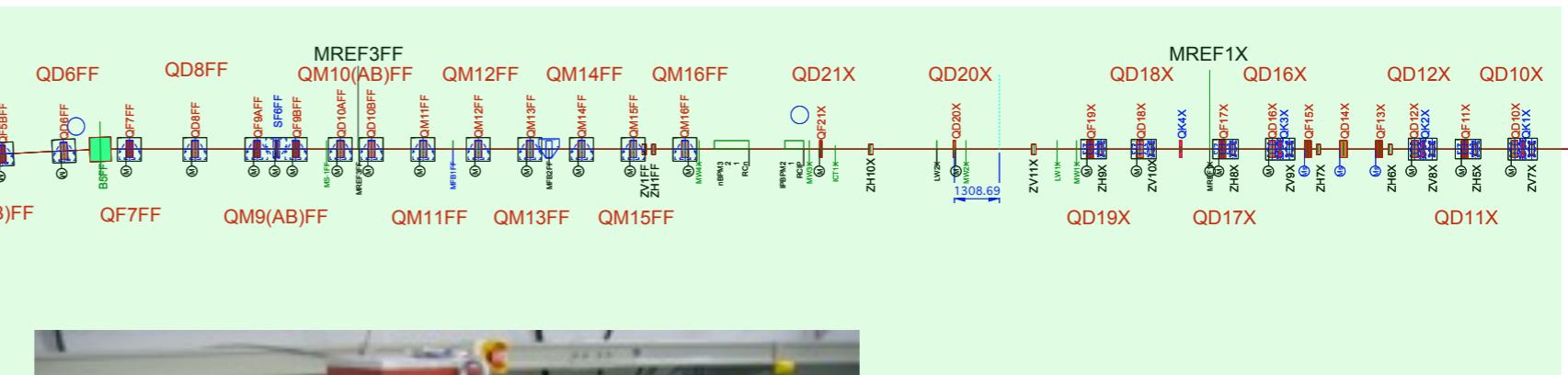
For preparation of the continuous run : calibration of BPM system, checkout of IPBPMs, OTRs, digital PLIC, IP carbon wire scanner and ATF2 model/lattice and study, i.e. BBA, background for IPBSM, dispersion and coupling corrections, emittance measurement by the OTRs as well as the wire scanners

ATF2 BPM layout

S-Band BPMs



C-Band BPMs



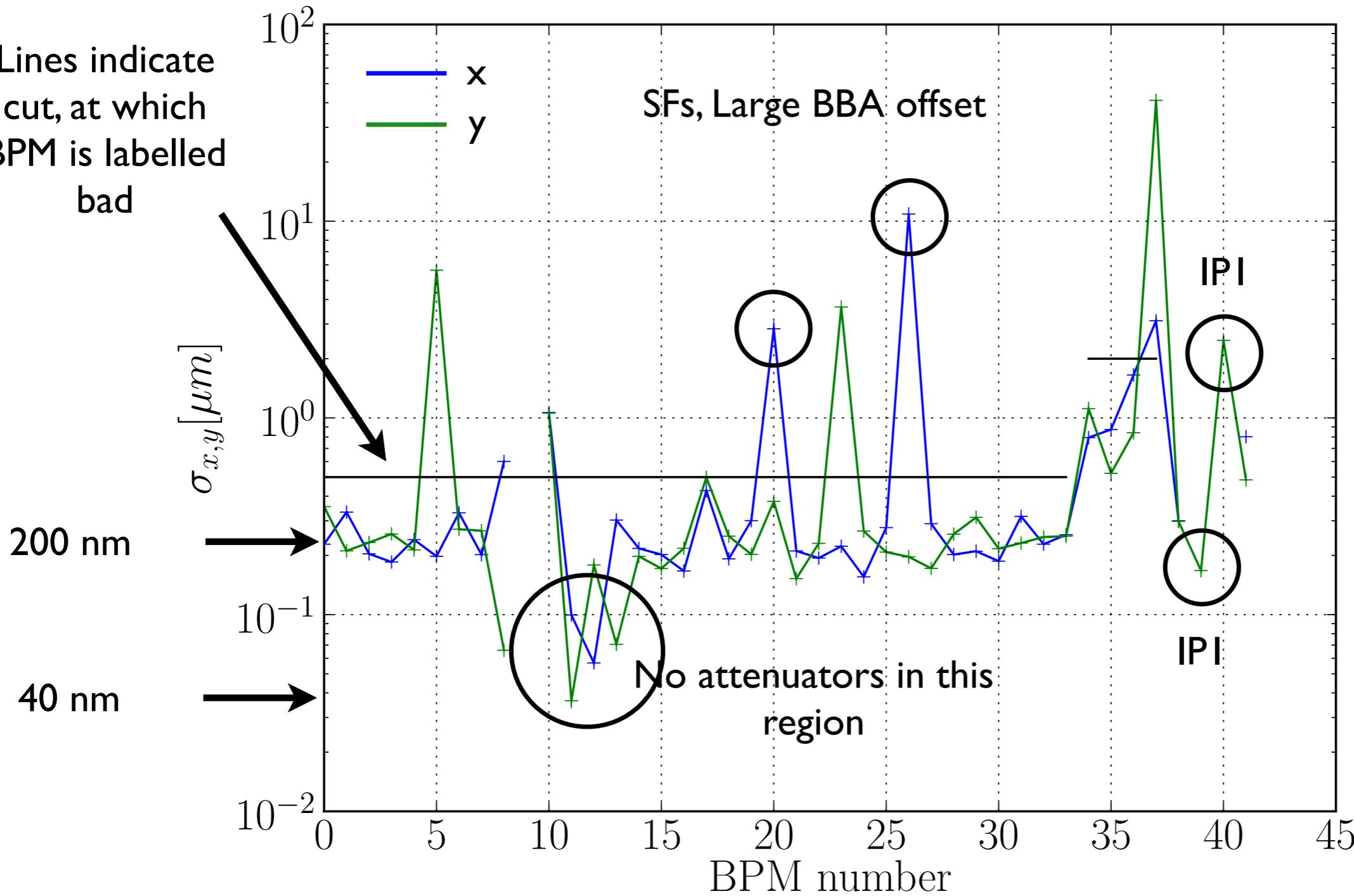
IP calibration 20110202

Boogert/Lyapin/Kim/Cullinan

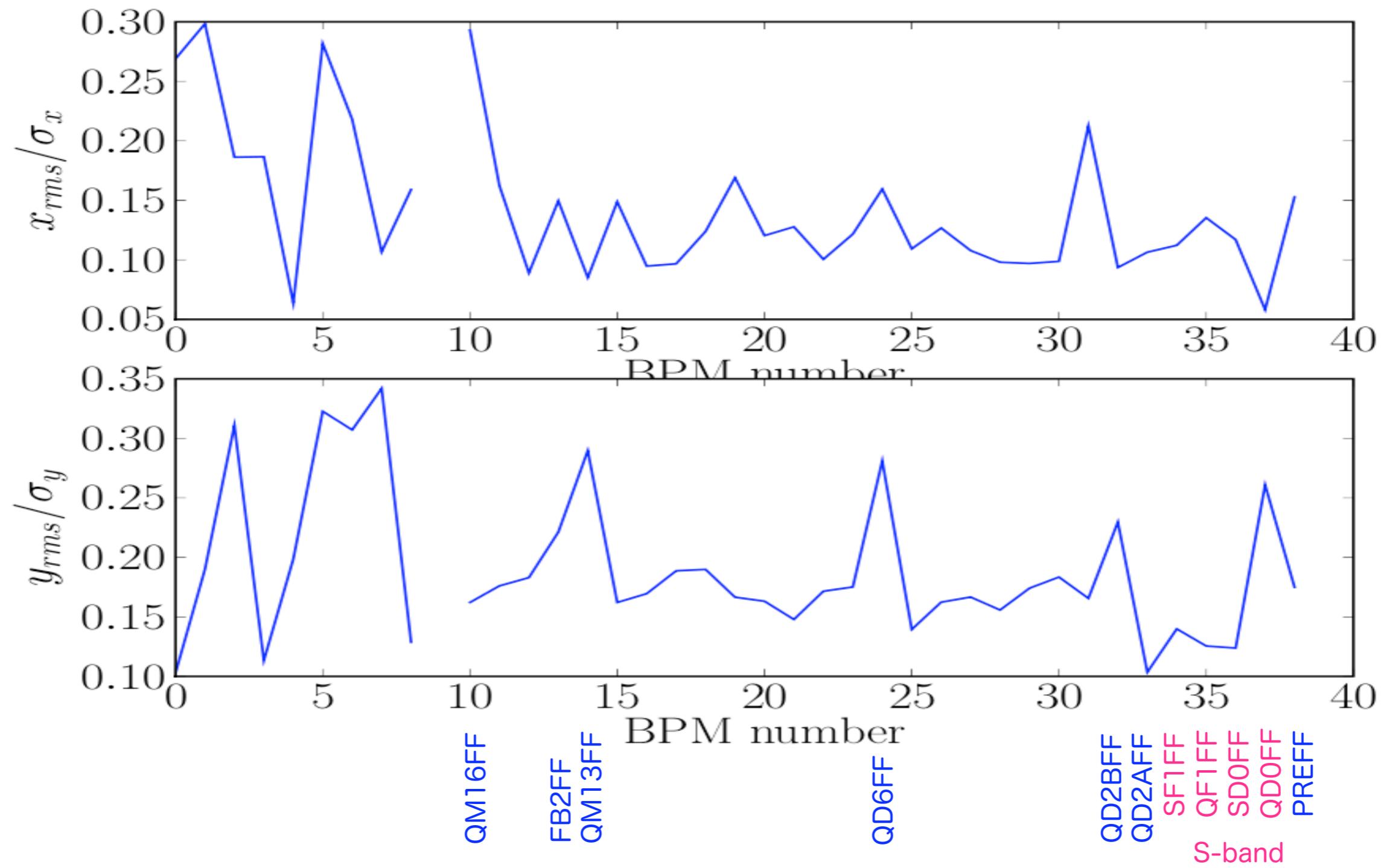
presented at ALCPG11, 22 March 2-11

bpmAllLog 20110202 035952

Lines indicate
cut, at which
BPM is labelled
bad

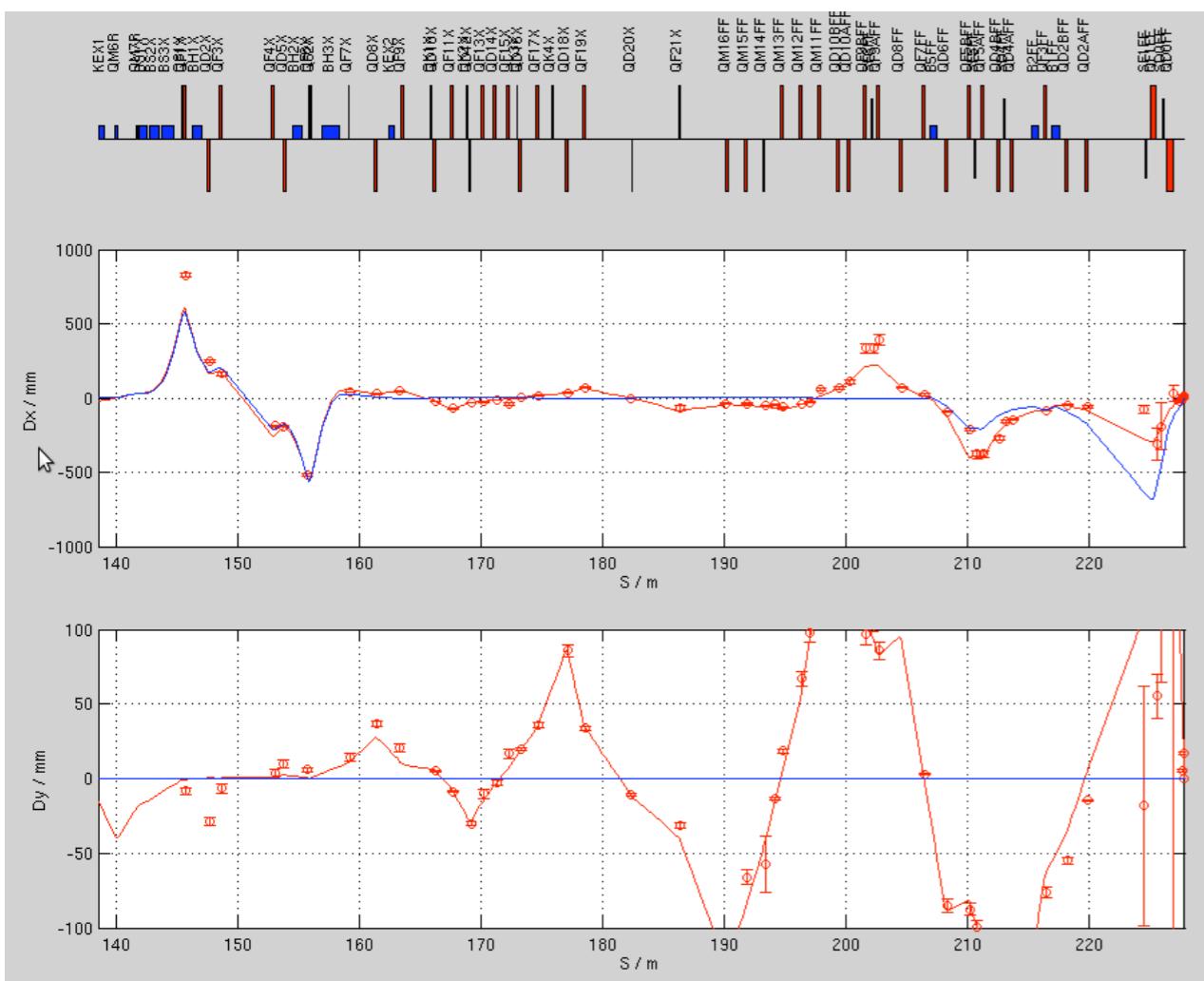


Jitter Analysis



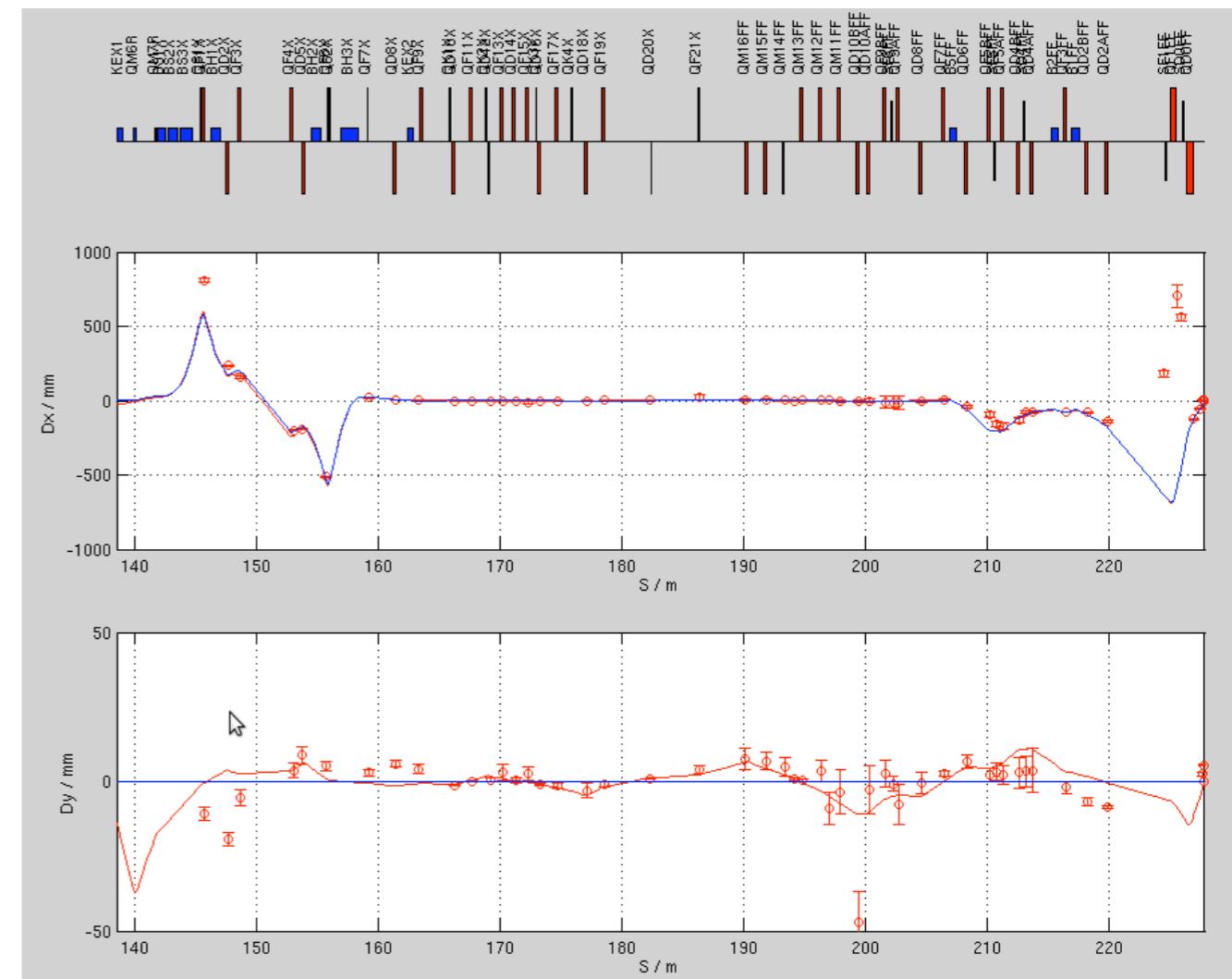
Dispersion Correction (December 7, 2010)

Before Correction



Fitted dispersion values for BEAMLINE element 1923 (IP):
 $\eta_x = 6.84 \pm 0.134 \text{ mm}$
 $\eta_x' = 64.5 \pm 2.02 \text{ mrad}$
 $\eta_y = 0.405 \pm 0.00726 \text{ mm}$
 $\eta_y' = -236 \pm 3.78 \text{ mrad}$

After Correction

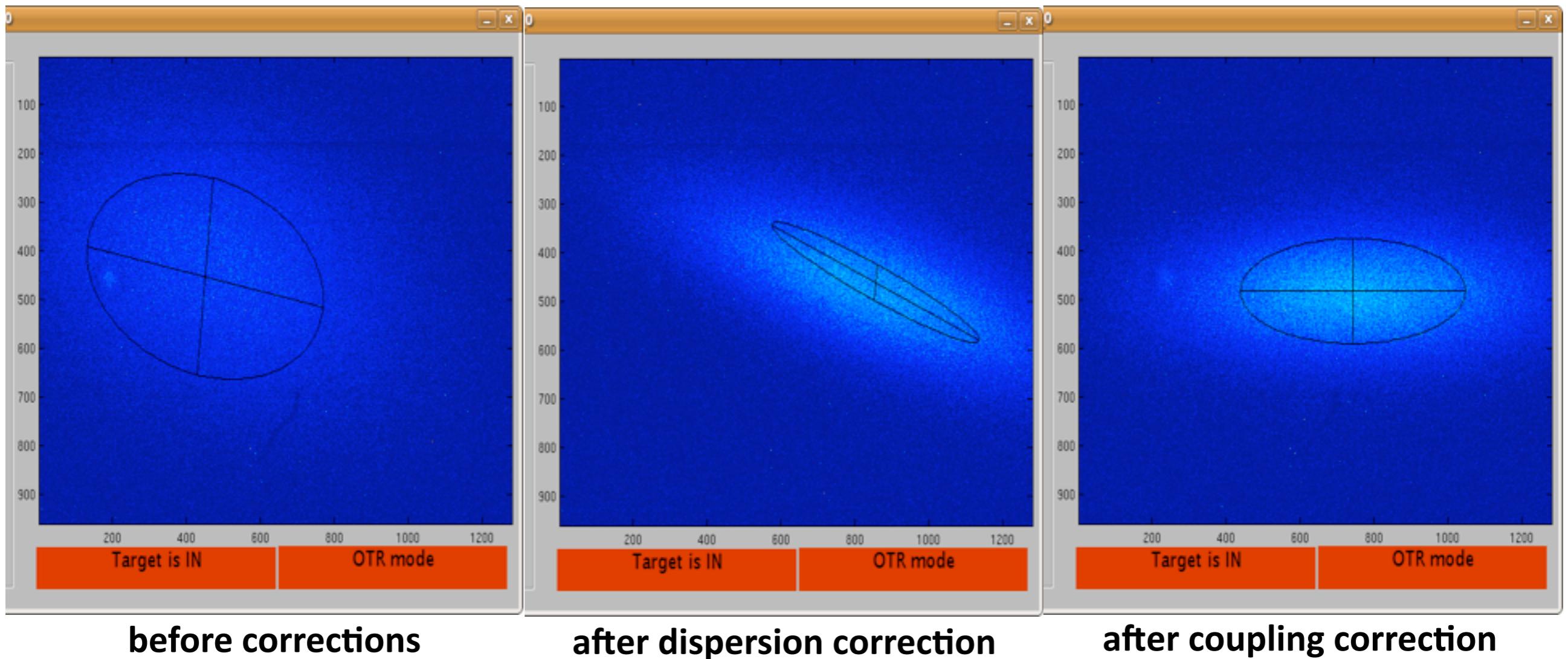


Fitted dispersion values for BEAMLINE element 1923 (IP):
 $\eta_x = 0.487 \pm 0.152 \text{ mm}$
 $\eta_x' = 140 \pm 2.31 \text{ mrad}$
 $\eta_y = -0.0163 \pm 0.00544 \text{ mm}$
 $\eta_y' = 12.6 \pm 1.93 \text{ mrad}$

Beam must be centered in QF1X/QF6X/QS1X/QS2X

Multi-OTR system

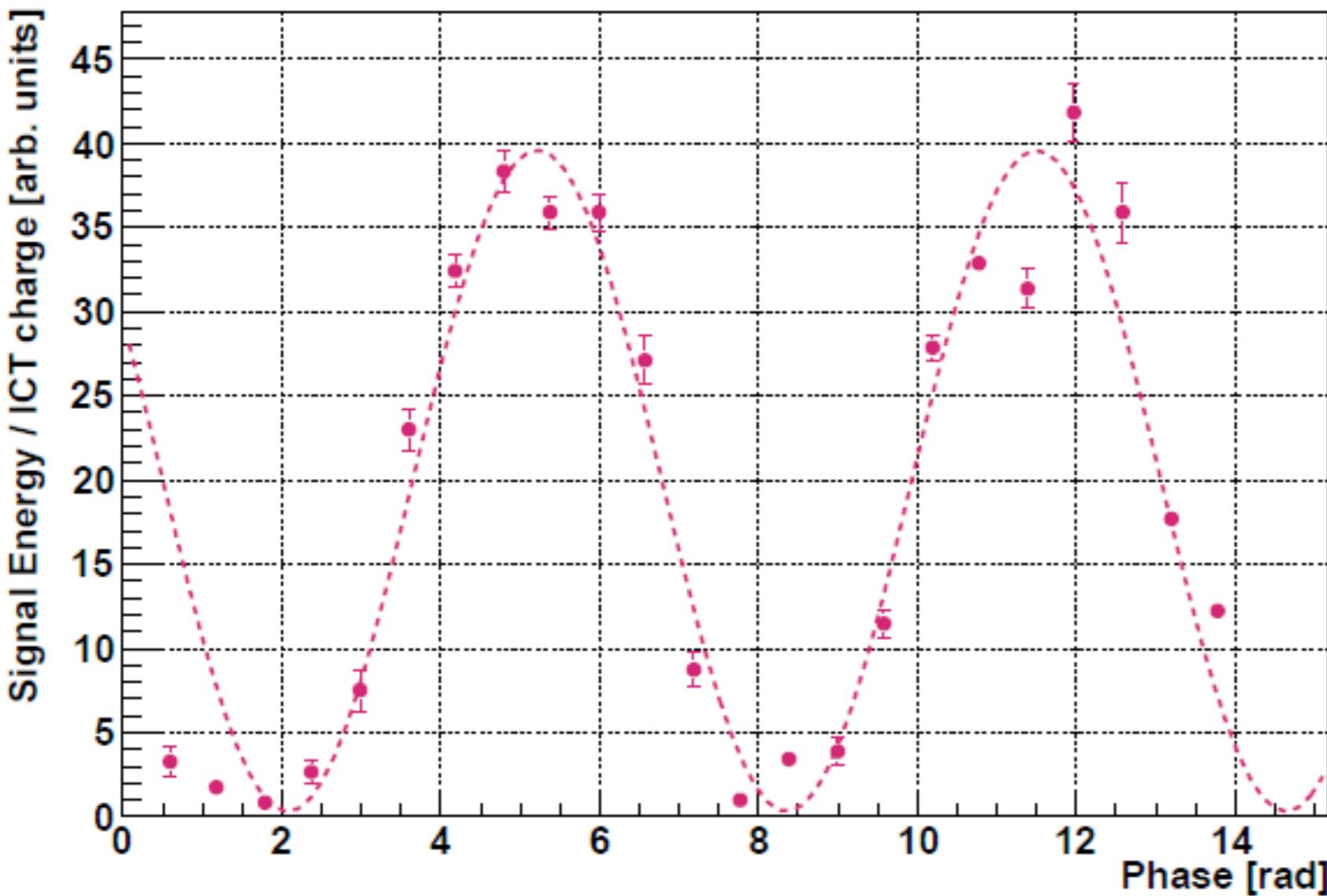
commissioned in Nov. - Dec., 2010



Cont. Tuning Week Summary

Monday	<ul style="list-style-type: none">•DR setup + tune ($\epsilon_y = 14\text{pm}$)•mOTR setup, tuning ($\epsilon_y < 34 \text{ pm}$ EXT, 27pm MW)•EXT Emit meas + cor•EXT Disp meas + cor
Tuesday	<ul style="list-style-type: none">•IP C wire measurements•Sext BBA•BPM checks + diagnostics•IP $\sigma_y < 2\mu\text{m}$
Wednesday	<ul style="list-style-type: none">•IPBSM 2 degree mode•Start $\sigma_y = \textcolor{orange}{1.8 \mu\text{m}}$•$\langle x'y \rangle$ scan, $\sigma_y = \textcolor{orange}{1.3\mu\text{m}}$•IPBSM 6 degree mode•$\sigma_y = \textcolor{orange}{1.0 \mu\text{m}}$•$\langle x'y \rangle$ scan, $\sigma_y = \textcolor{orange}{804 +/- 133 \text{ nm}}$•Waist_y scan, $\sigma_y = \textcolor{orange}{720 +/- 53 \text{ nm}}$
Thursday	<ul style="list-style-type: none">•IPBSM tune, $\sigma_y = \textcolor{orange}{612 +/- 103 \text{ nm}}$•+ 4 hours, $\sigma_y = 482,394,594,498 = \textcolor{orange}{492 +/- 82 \text{ nm}}$•$\langle xy \rangle$ scan $\sigma_y = 327,401,375 = \textcolor{orange}{368 +/- 38 \text{ nm}}$

Results of the continuous run in December, 2010



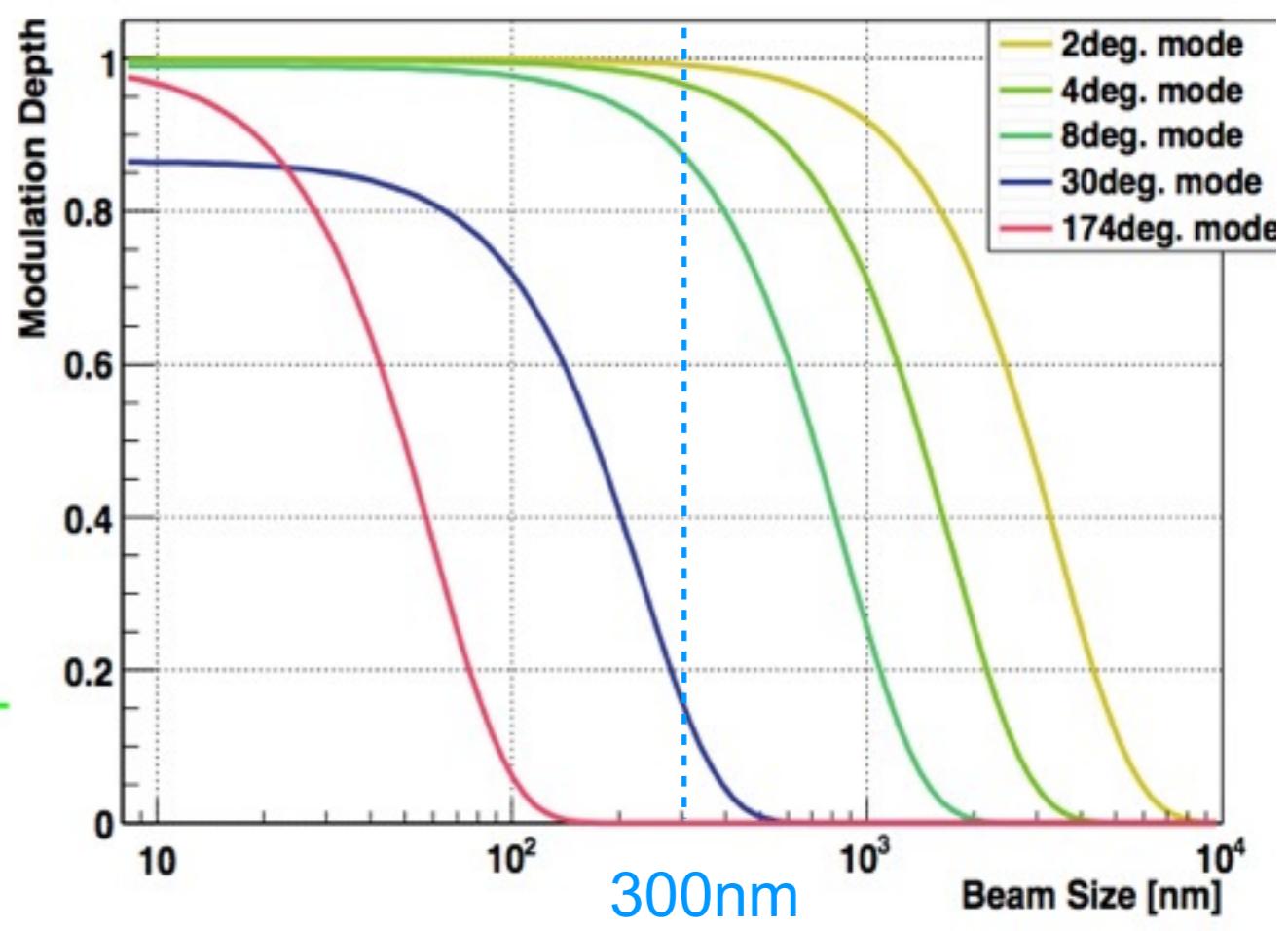
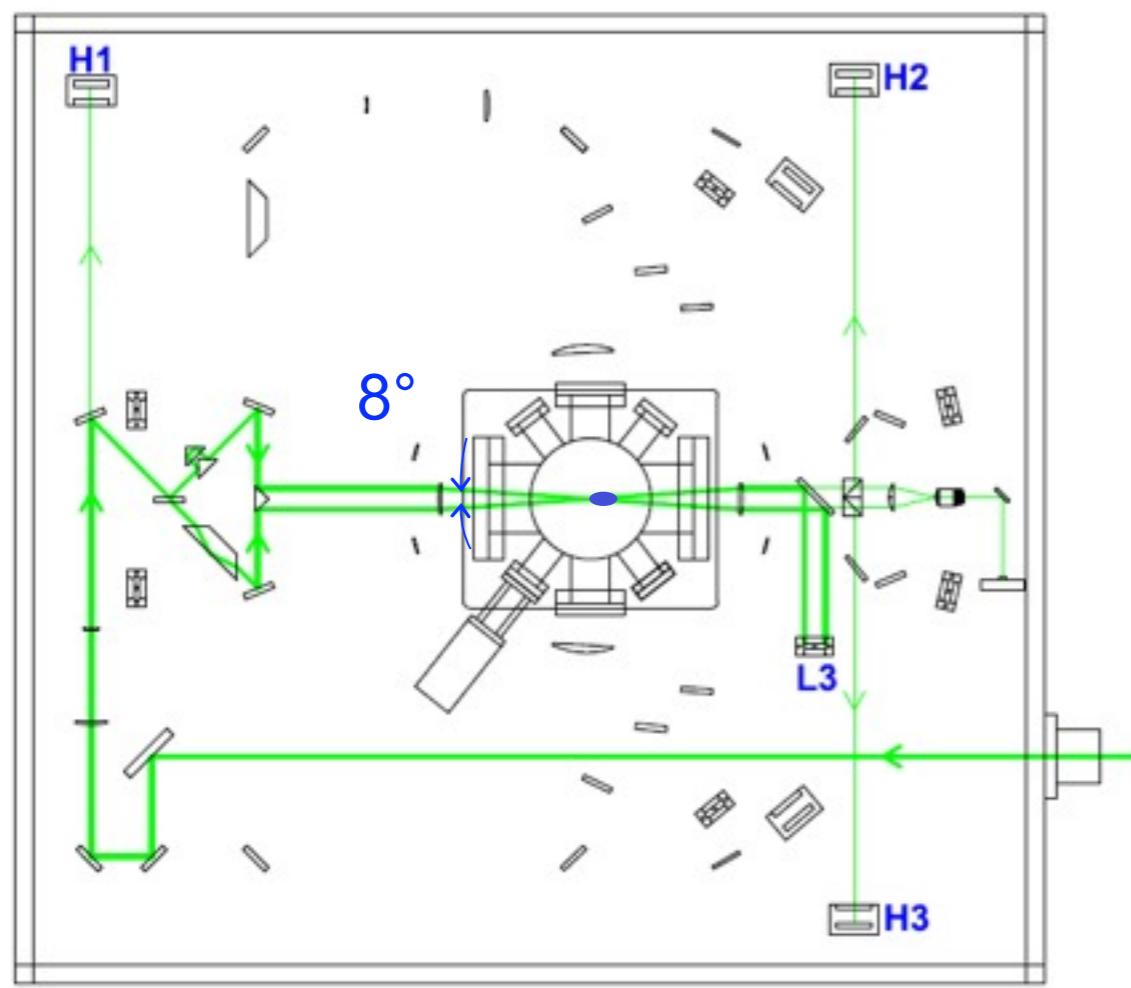
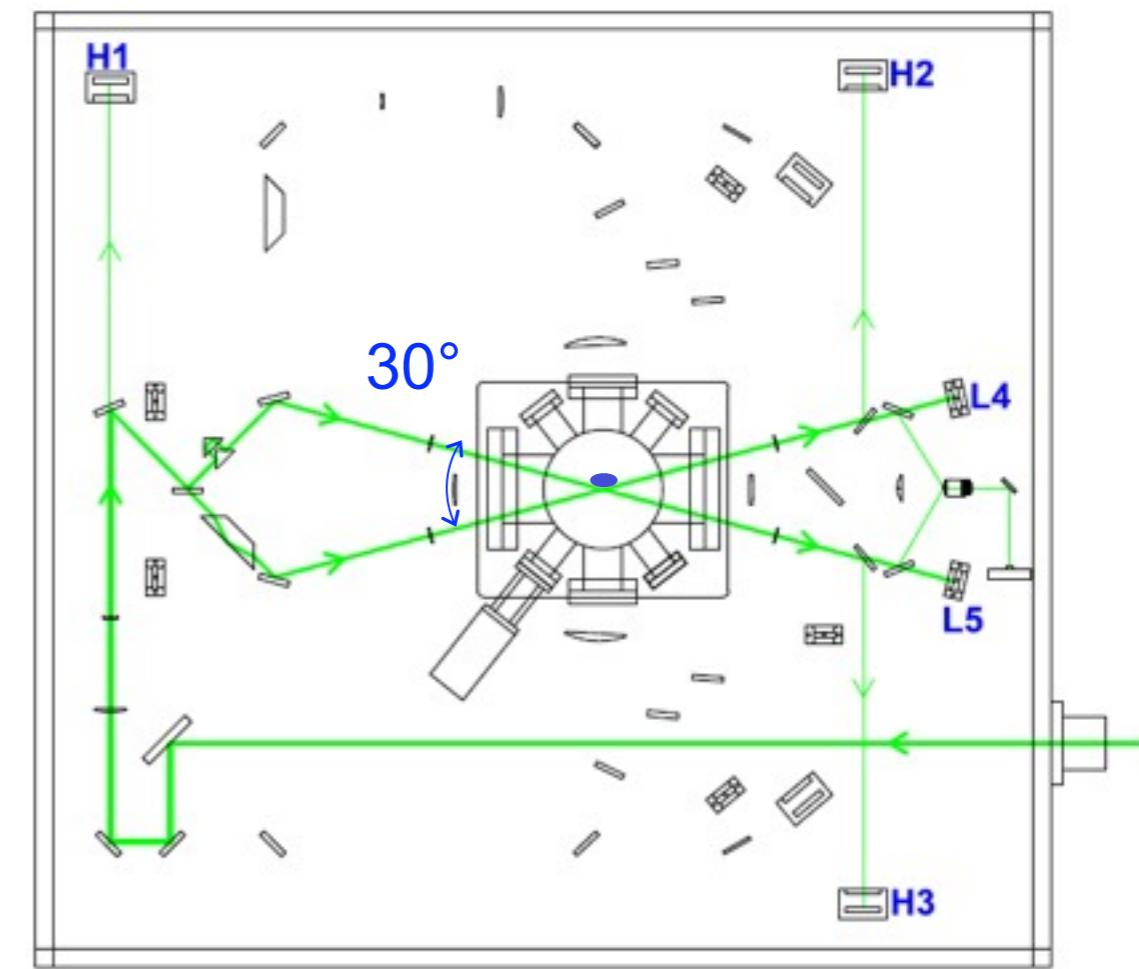
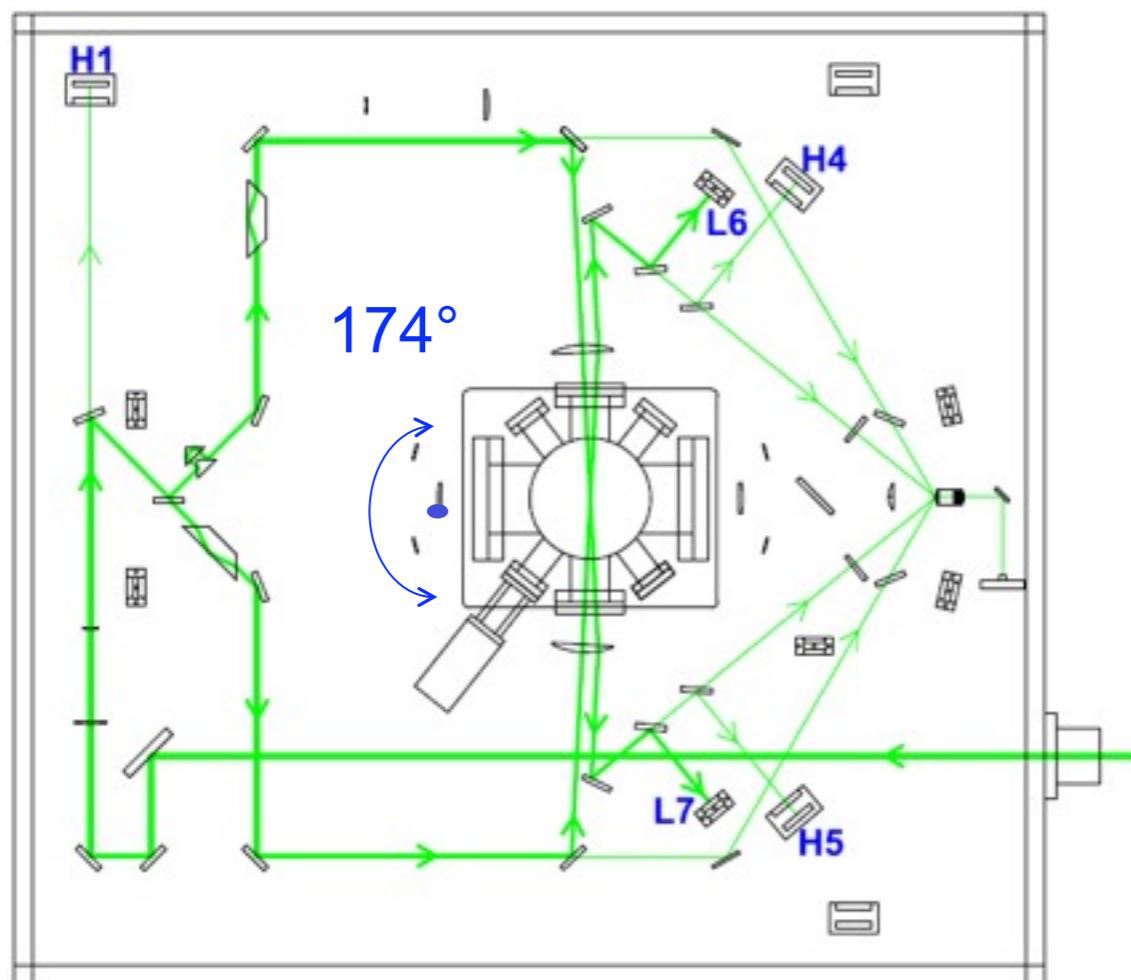
Interference scan plot for one of the smallest beam sizes measured at 5.96 degree on Dec 16, 2010.

$$\sigma_y^* = 280 \pm 90 \text{ nm}$$

$$M_{\text{meas}} = 0.918 \sim 0.984$$

$$\beta_x^* = 10 \text{ mm}$$

$$\beta_y^* = 0.1 \text{ mm}$$



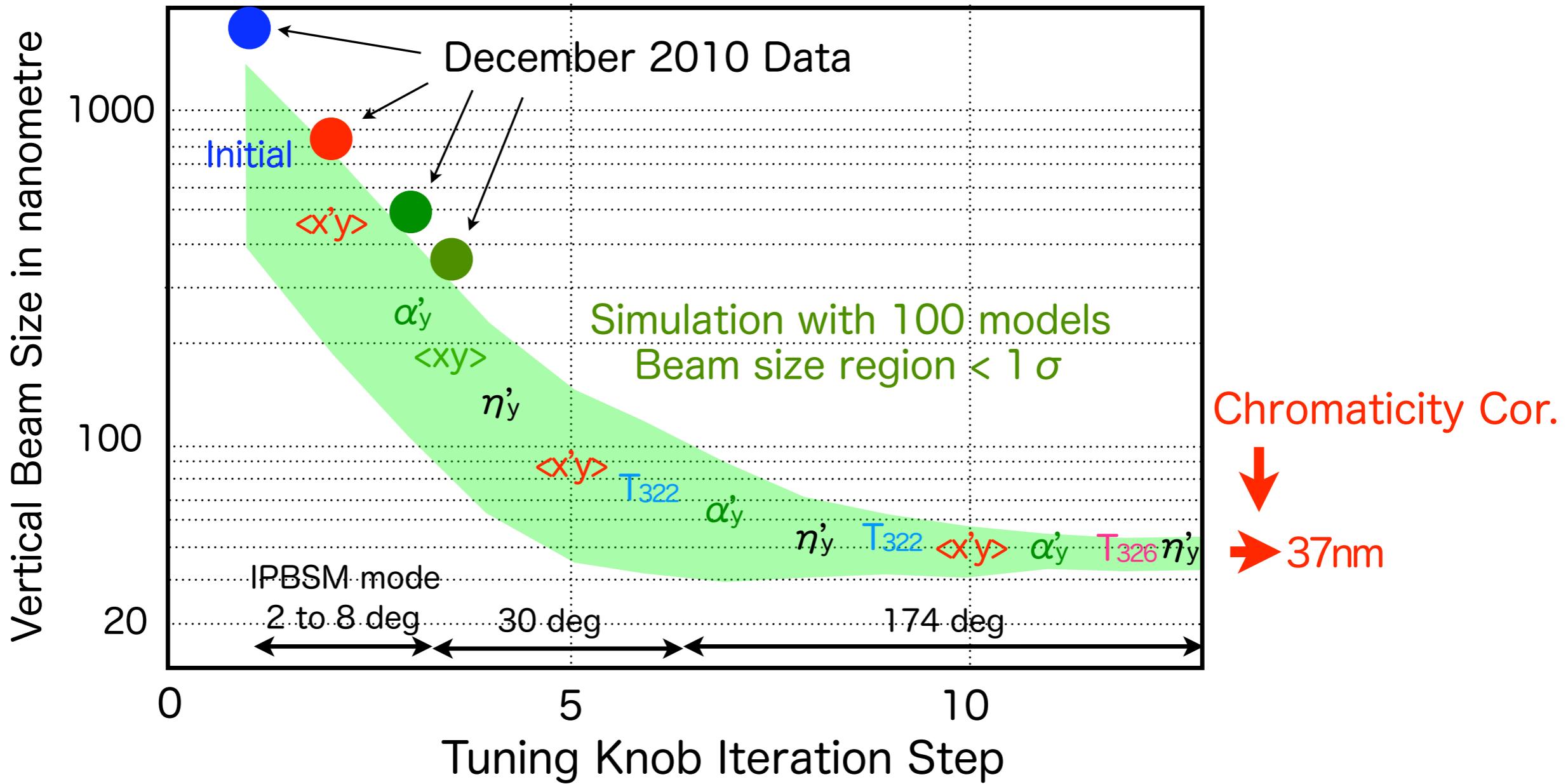


Figure 10-1 : Performance of beam size tuning at IP. The experimental data in December 2010 are plotted together with the expectations ones. First data shows the initial beam size before any correction with the beam size measurement by the IPBSM, and $\langle x'y \rangle$, $\alpha'y$, $\langle xy \rangle$, $\eta'y$, T322 and T326 are tuning knobs of horizontal angle, the vertical waist, coupling, vertical dispersion, second order aberrations of horizontal angle (T322) and dispersion (T326), respectively.

2011 before summer

1 2011							2 2011							3 2011							4 2011							5 2011							6 2011						
Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa							
						1		1	2	3	4	5			1	2	3	4	5		1	2	3	4	5	6	7		1	2	3	4									
2	3	4	5	6	7	8	6	7	8	9	10	11	12	6	7	8	9	10	11	12	3	4	5	6	7	8	9	5	6	7	8	9	10	11							
9	10	11	12	13	14	15	13	14	15	16	17	18	19	13	14	15	16	17	18	19	10	11	12	13	14	15	16	12	13	14	15	16	17	18							
16	17	18	19	20	21	22	20	21	22	22	23	24	25	20	21	22	23	24	25	26	17	18	19	20	21	22	23	22	23	24	25	26	27	28							
23	24	25	26	27	28	29	27	28						27	28	29	30	31			24	25	26	27	28	29	30	29	30	31				26	27	28	29	30			
30	31																																								

First priority is ATF2-37 nm until the end of March.
... 7 weeks

Recovery from the
earthquake damage

The 30 degree mode of IPBSM was studied in Jan. to Feb.
Excellent beam stability in February.

However ;

16 Feb. fire at the modulator #0 at the ATF-LINAC

10 Mar. resume the ATF operation and ATF2 beam tuning
the stability was re-produced, i.e. stable !

11 Mar. Great Eastern Japan Earthquake (M9.0)

Cavity BPM Calibration

- All cavity BPMs calibrated, including IP-BPM system (MPREIP, IPBPMA, IPBPMB, MPIP)
- Improved t_0 code from Stewart
- Code improvements plus excellent beam stability and charge $0.9\text{-}1 \times 10^{10}$
 - Best calibrations ever seen, clean and easy to do
- Consequently get superb modeling of beamline...
- Mechanical alignment of 4 IPBPM positions to IPBSM orbit to within $\sim < 100\text{um}$.

IPBSM issue

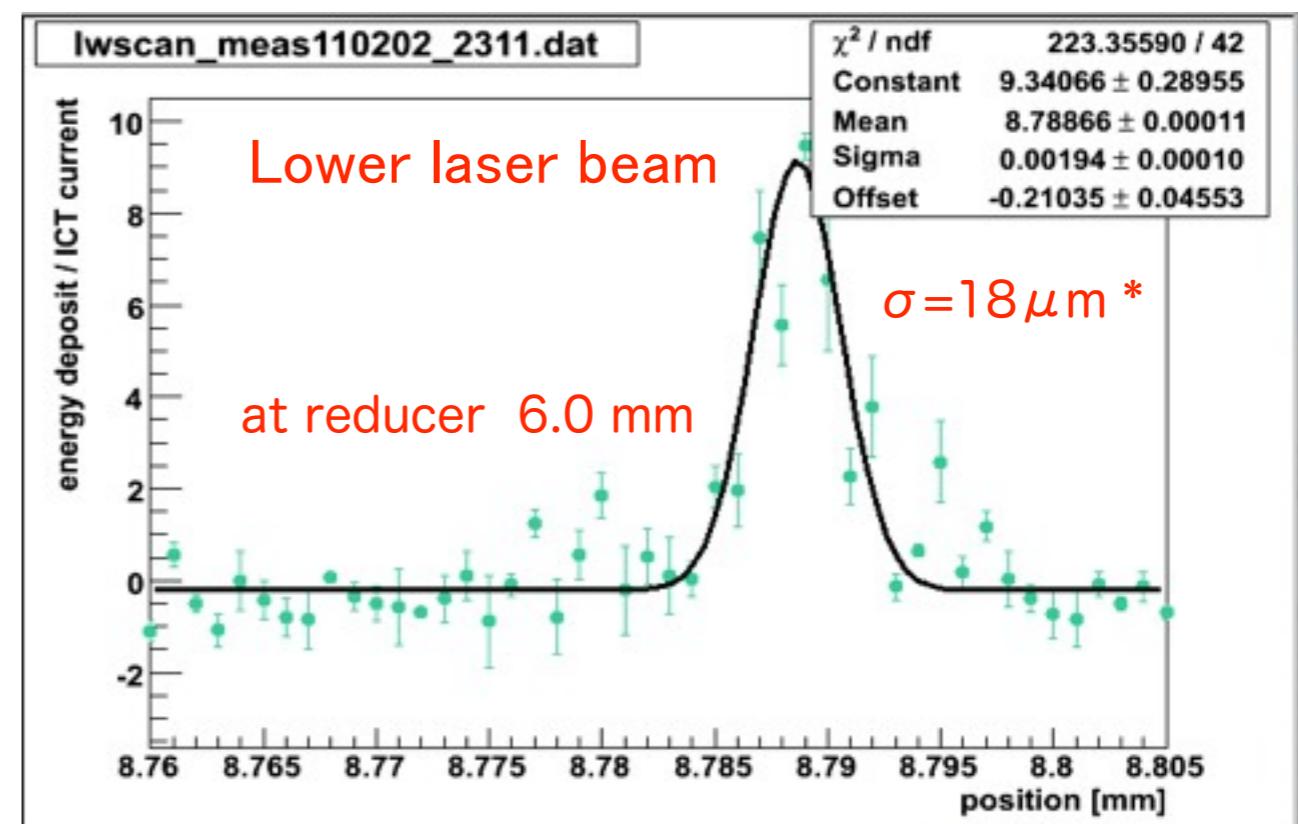
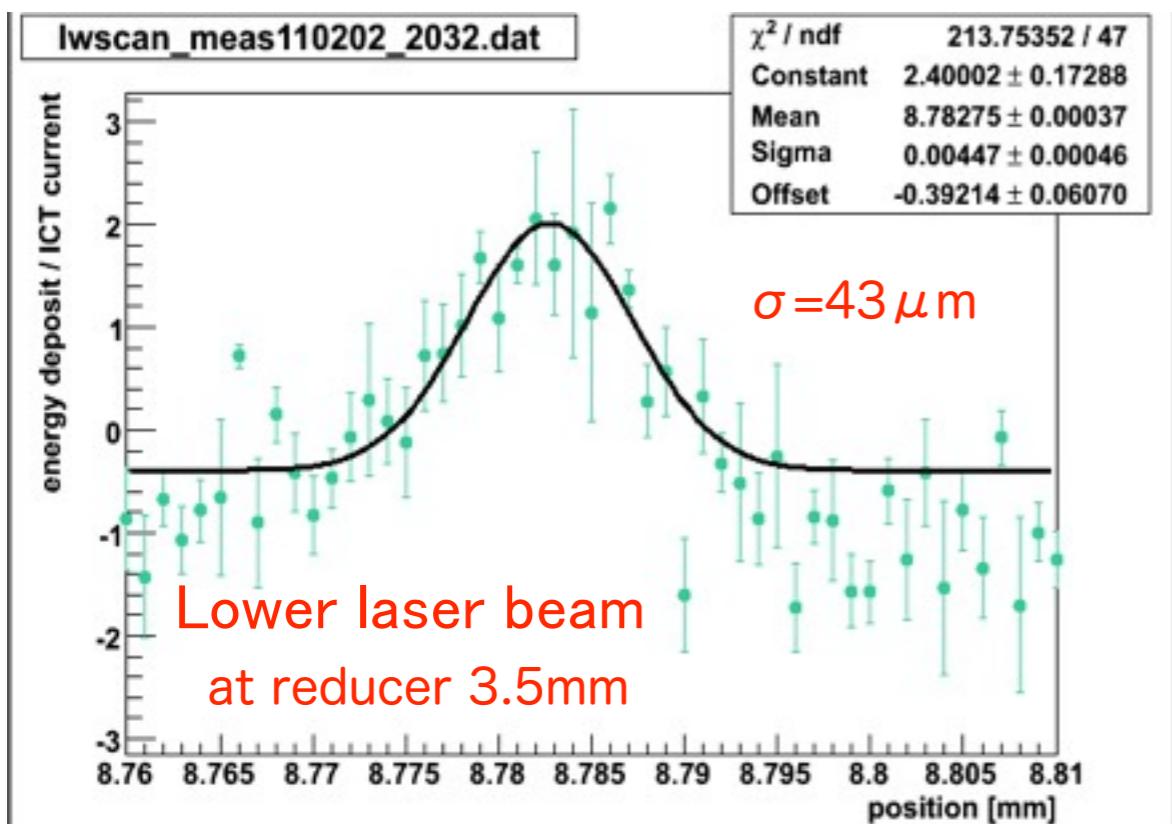
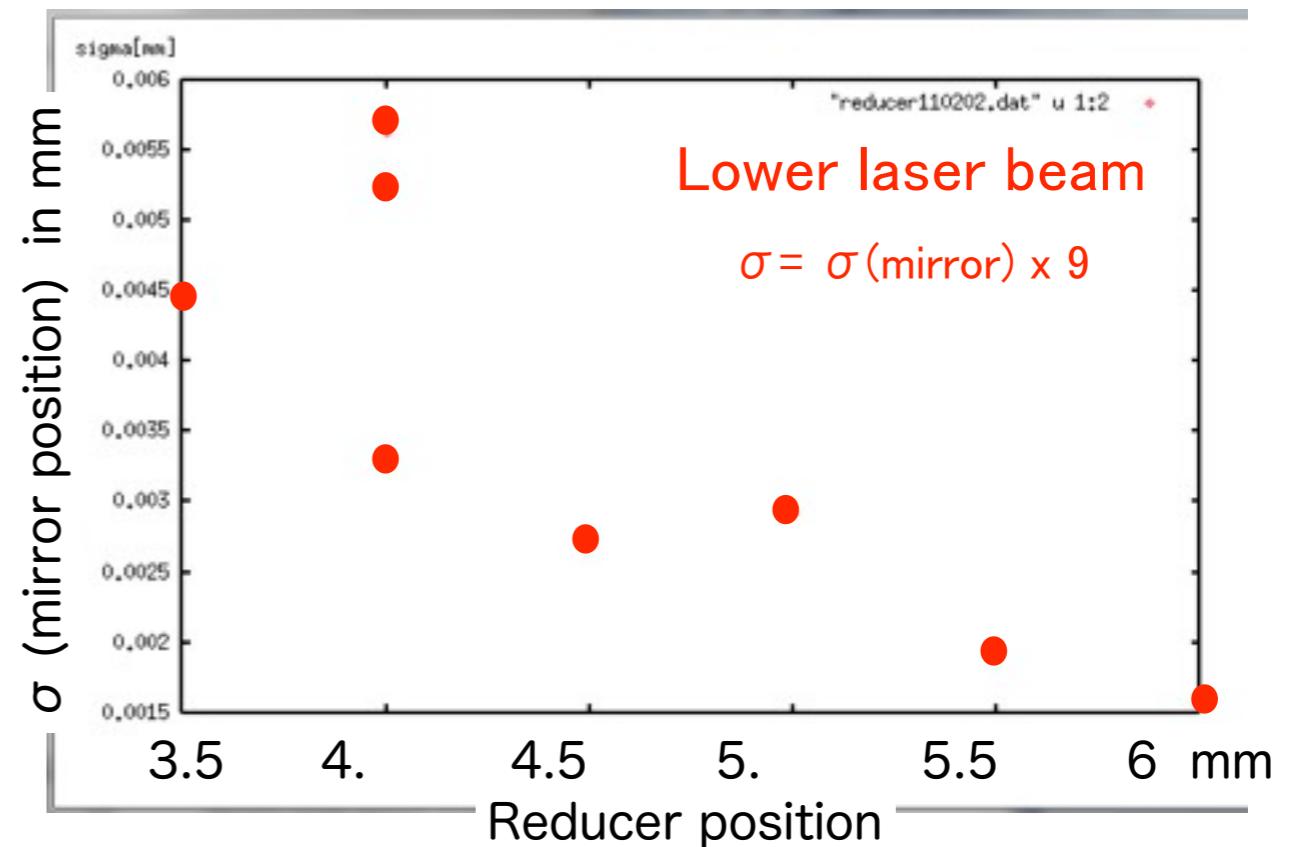
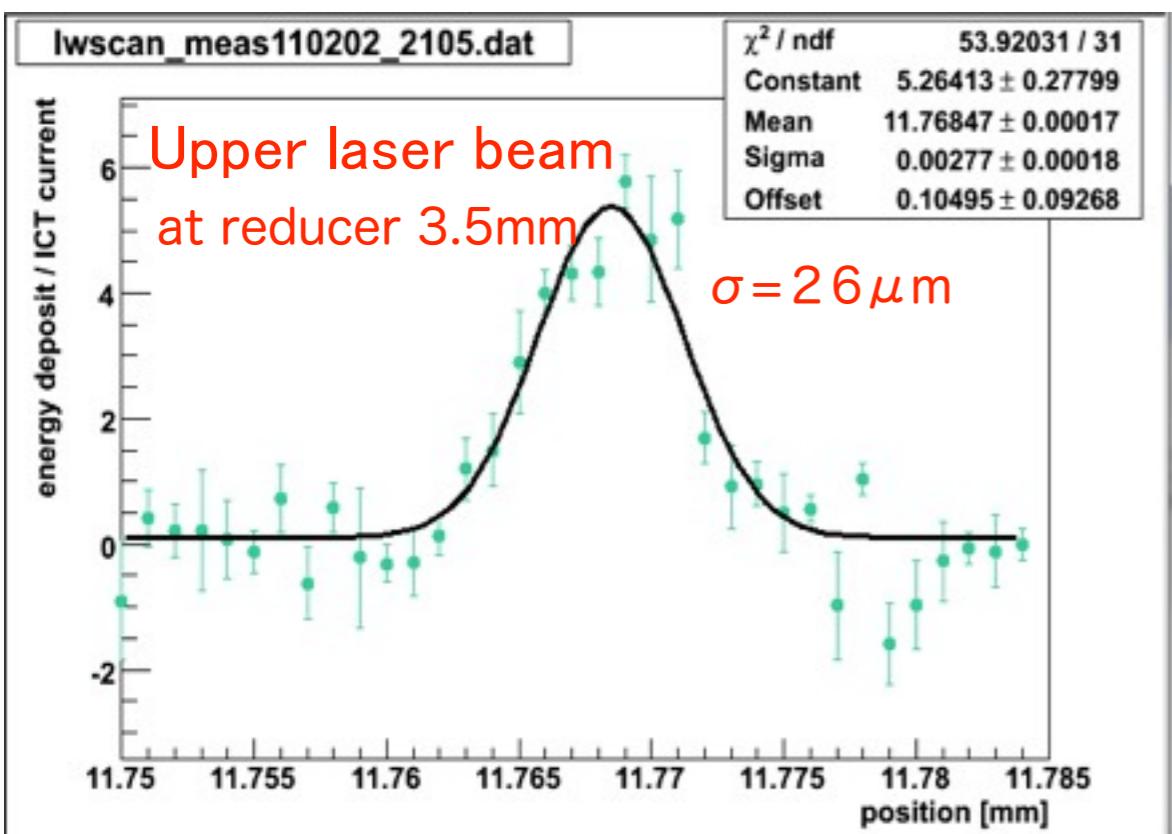
Signal & BG levels : May and Dec 2010

	Optics	Signal [GeV]	BG [GeV]	Beam Current ICT [$10^9 e^-$]
May, 2010	$\beta^* \times 10$ optics	150	15	~ 4
Dec, 2010	nominal	15* - 60	100	~ 3

* After problem of unfocused laser , especially at 30 deg.

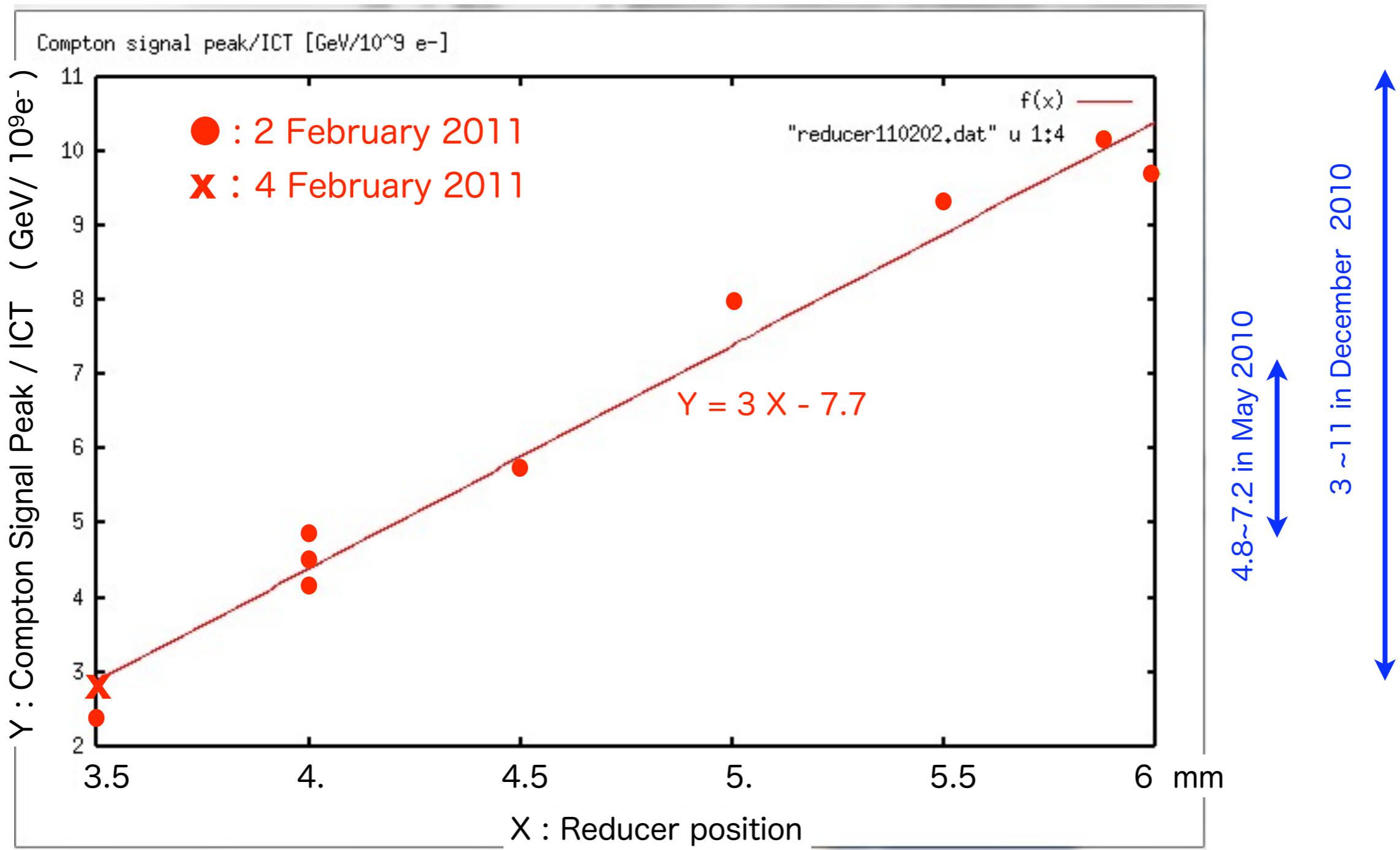
IPBSM : reducer scan at 30 degree mode, 2 February 2011

The laser beam sizes are inversely proportional to the reducer position.



IPBSM : reducer scan at 30 degree mode, 2 February 2011

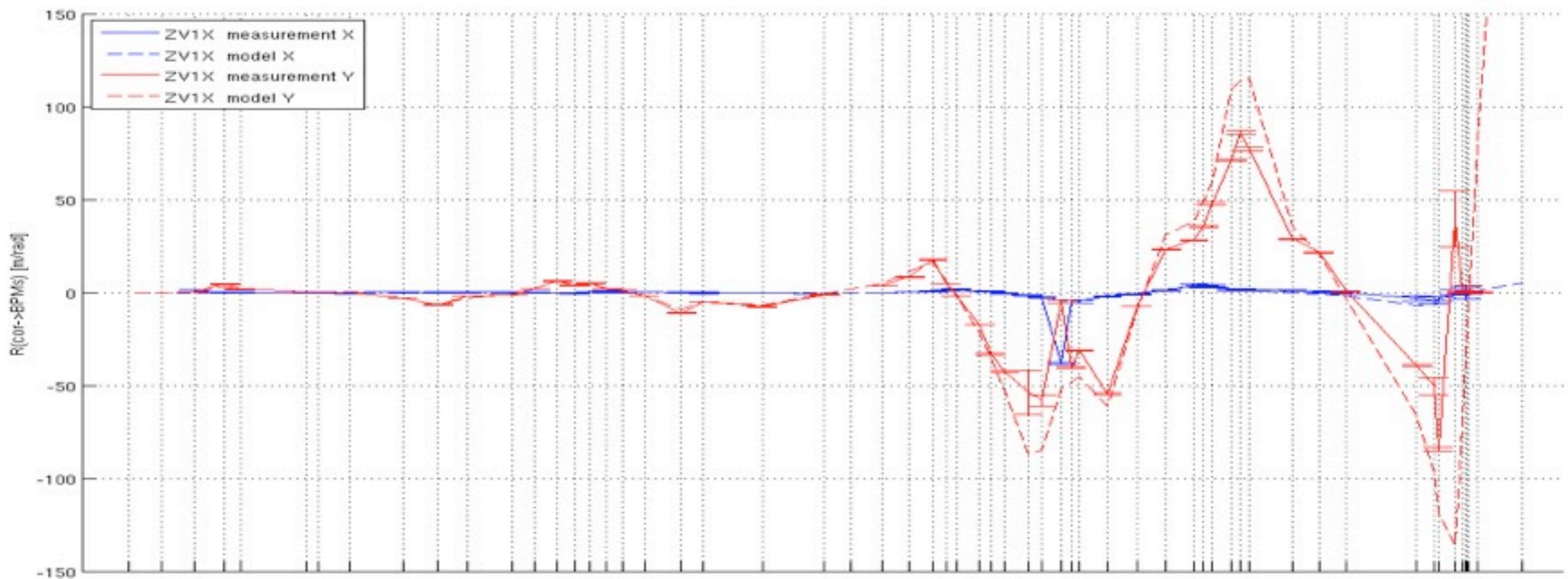
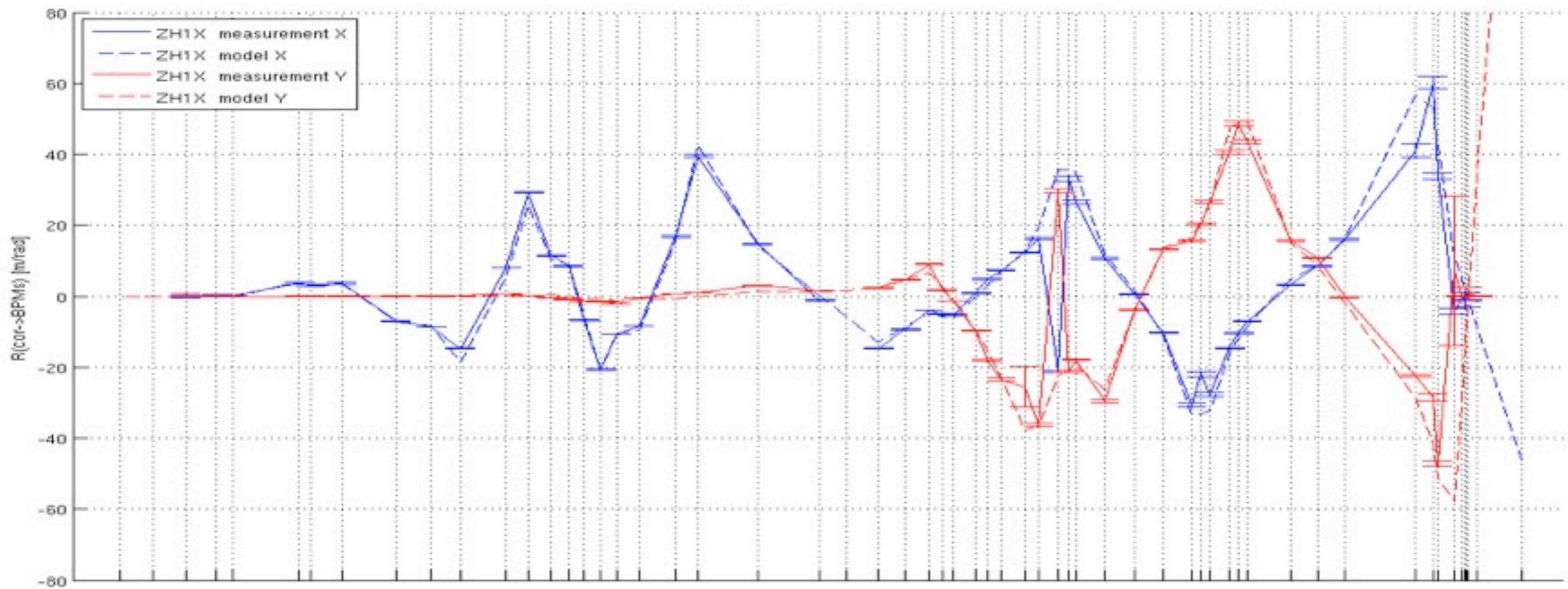
Signals are proportional to the reducer position, i.e. the laser beam size.



note: σ varied from 43 to 15 μ m as the reducer from 3.5 to 6mm

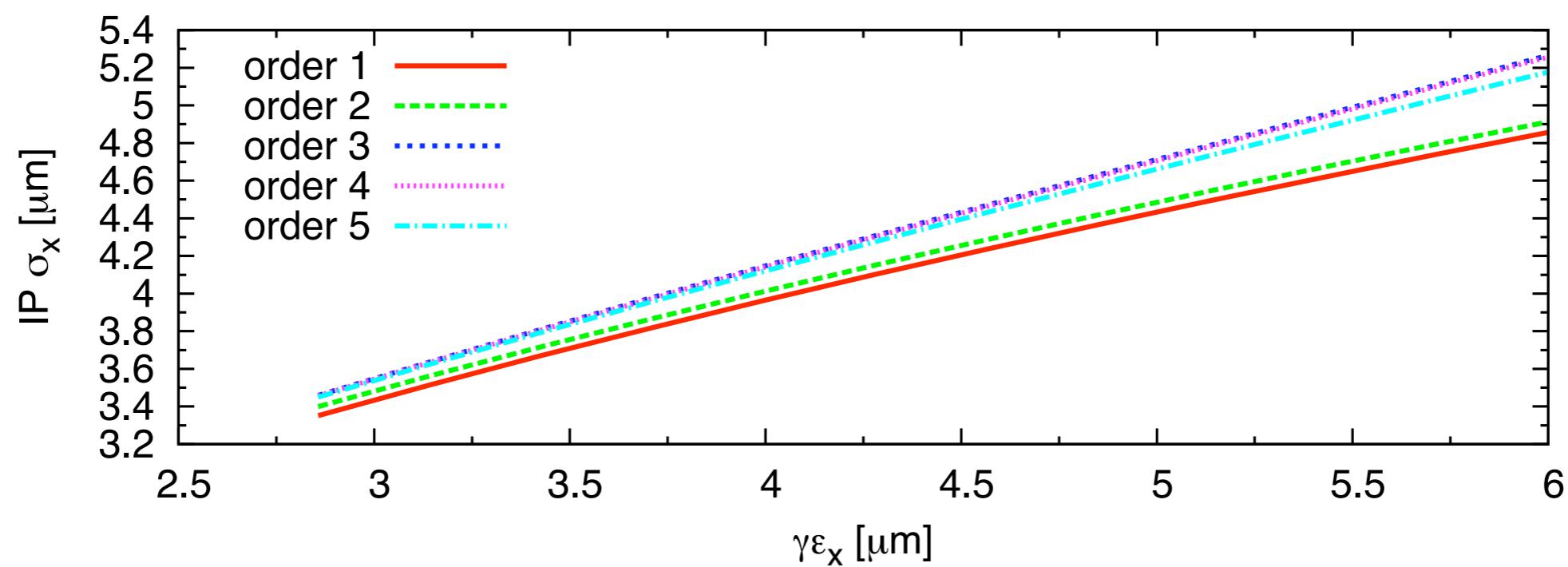
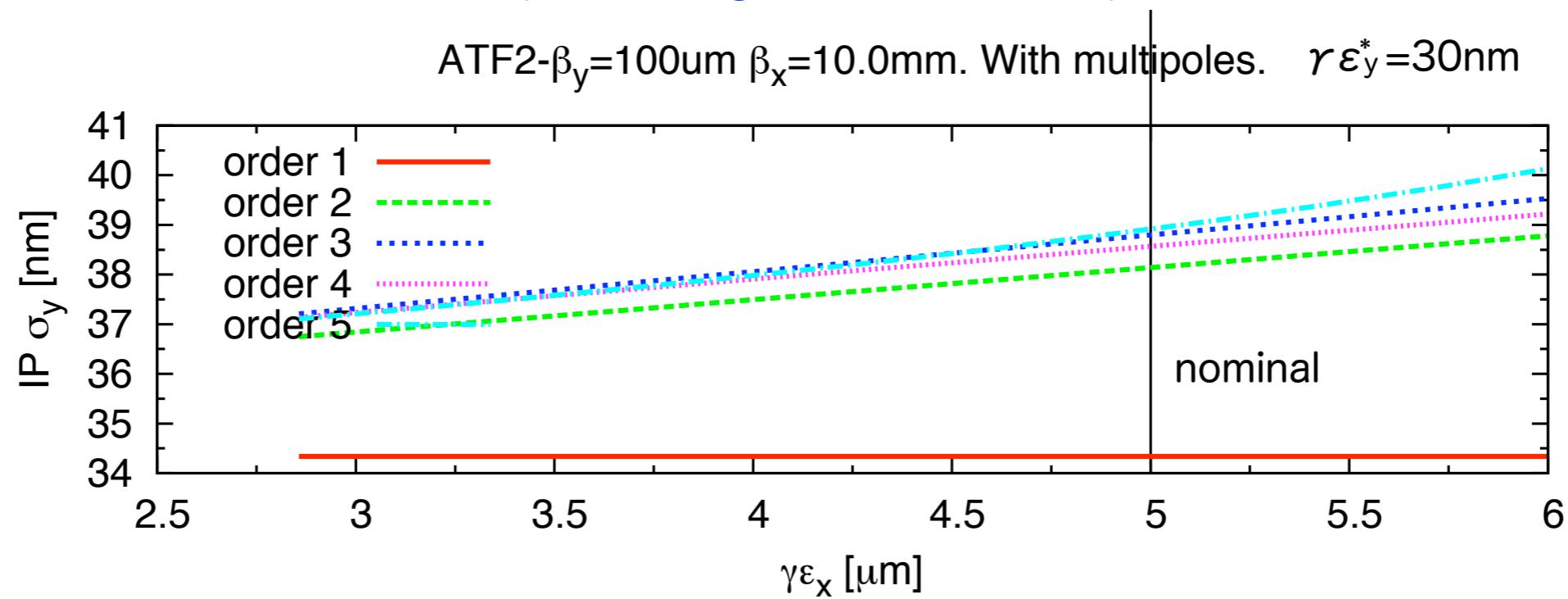
Optics Model Checked : Response by a steering magnet from the SVD analysis, in February 2011

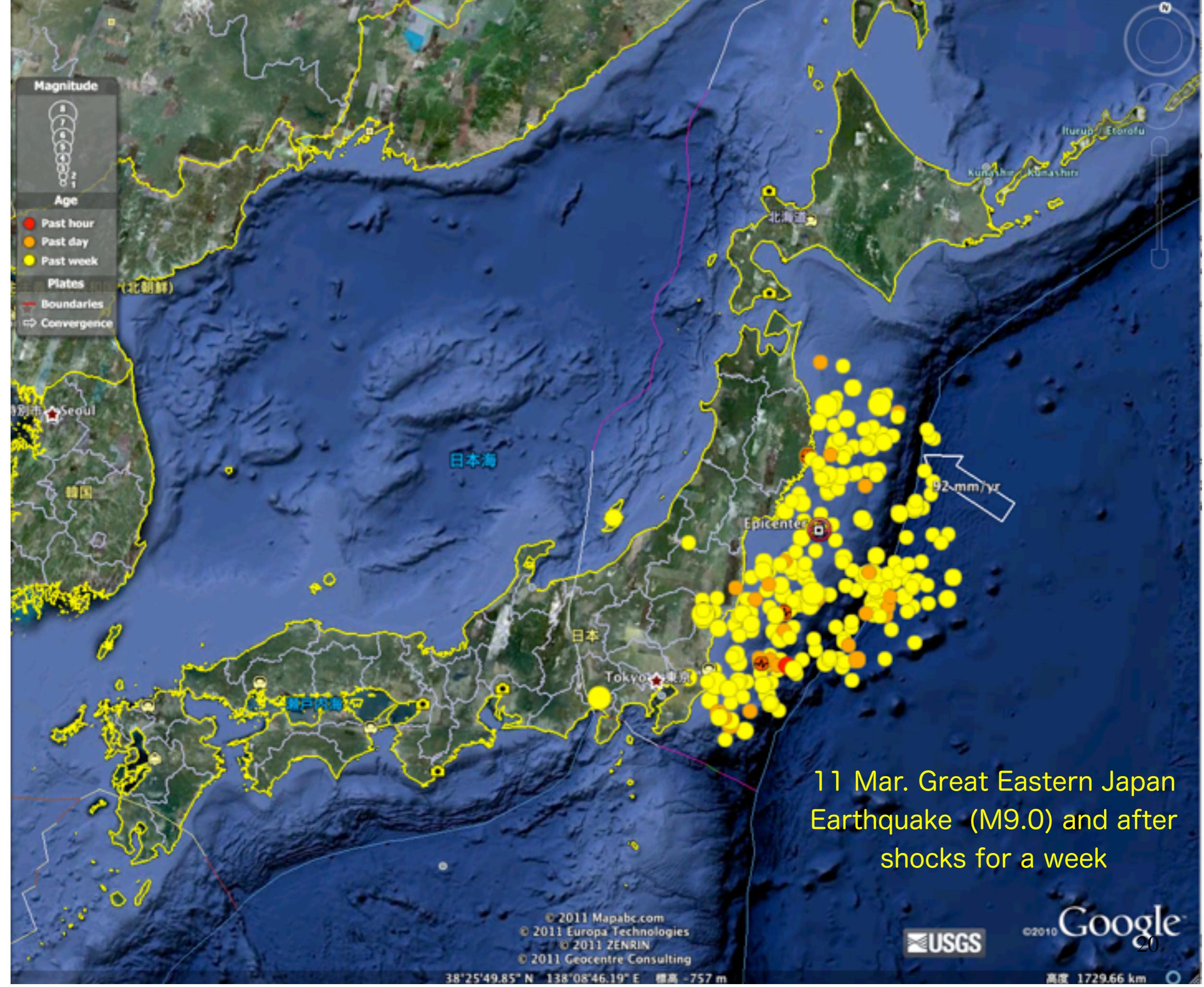
by Y. Renier



Estimation of multipole components in the QEA magnets for the re-matched optics with powering a skew sextupole

by Edu M. Lacoma





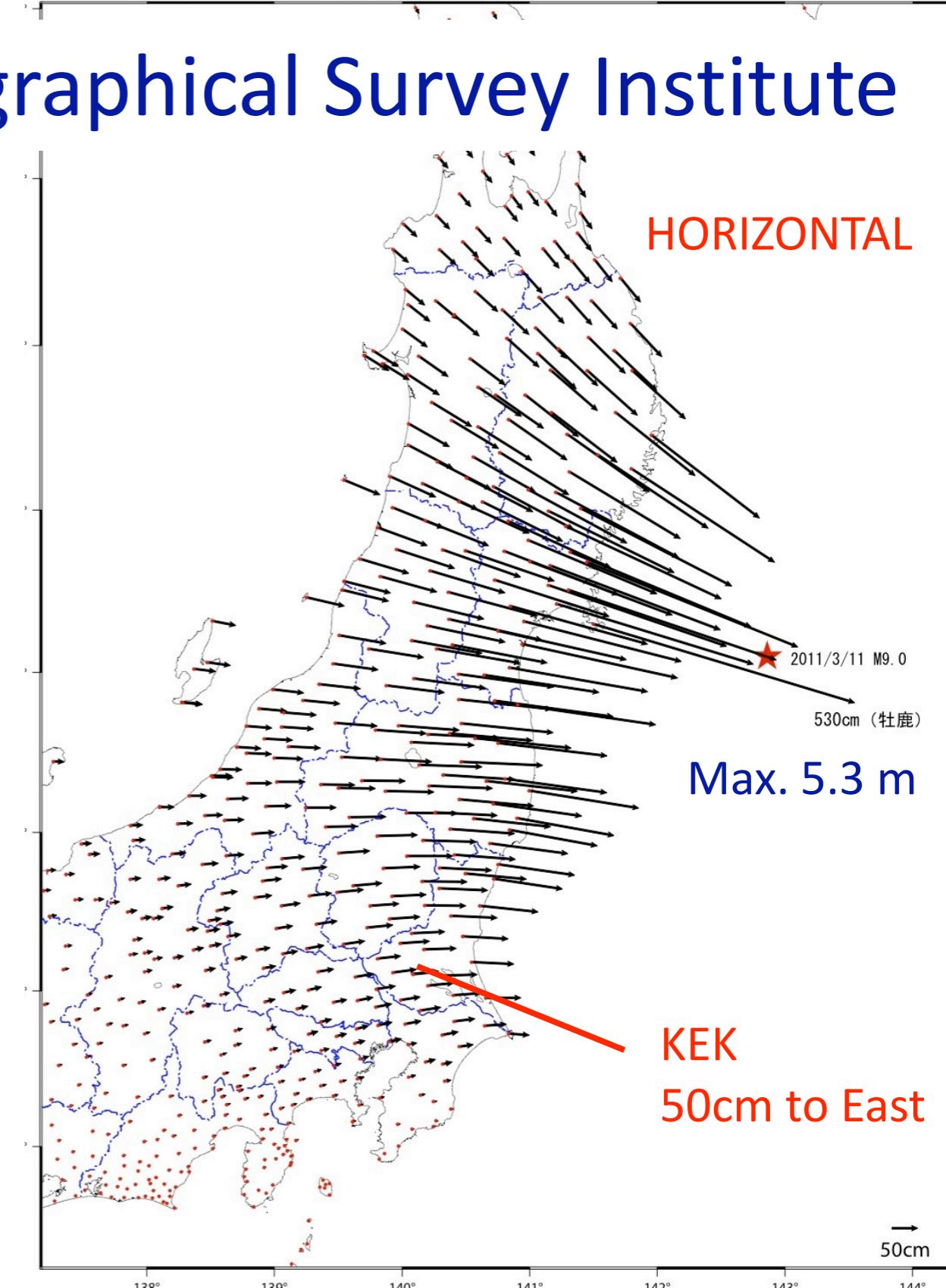
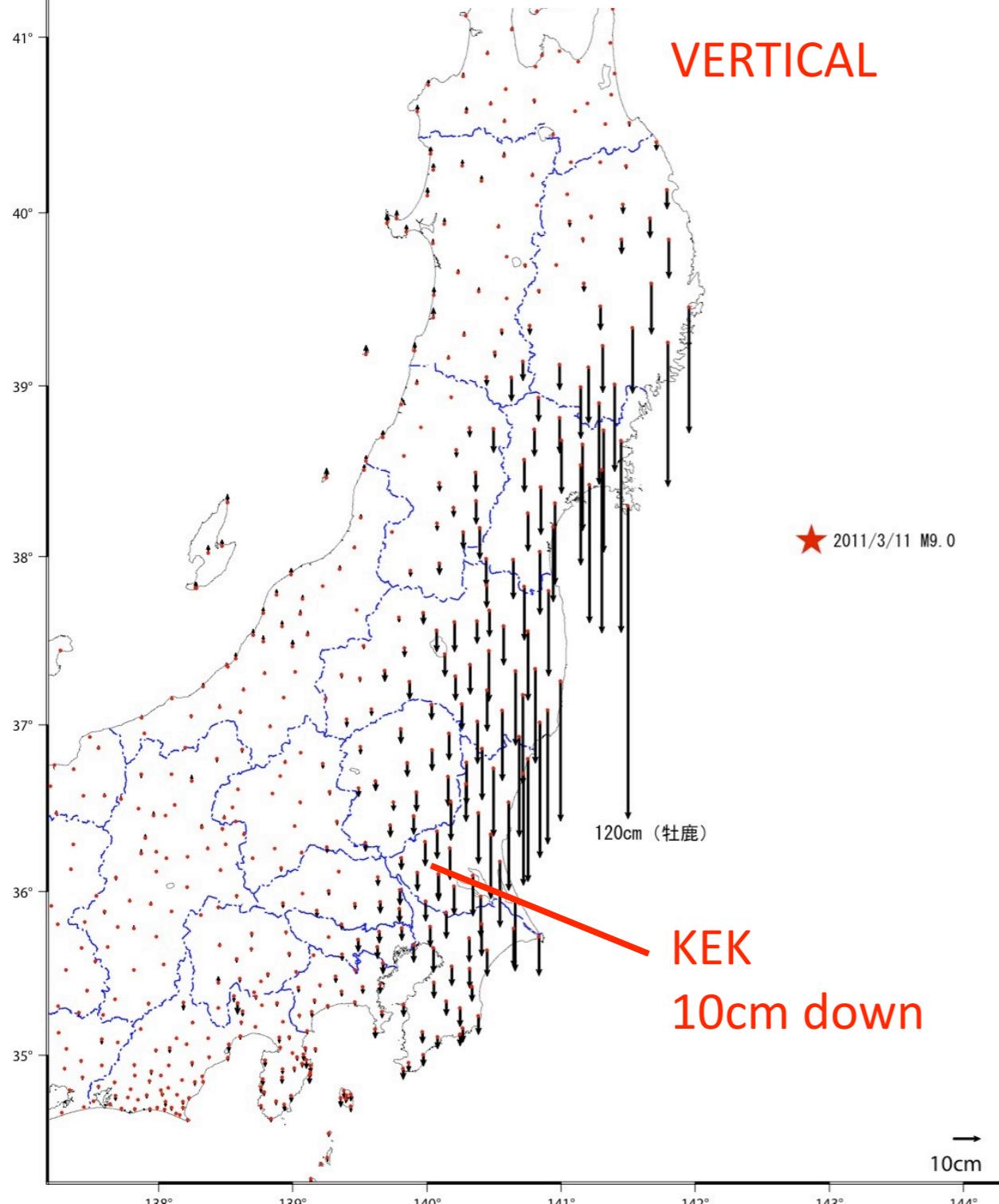
11 Mar. Great Eastern Japan
Earthquake (M9.0) and after
shocks for a week

基準期間：2011/03/01 21:00 - 2011/03/09 21:00
比較期間：2011/03/11 18:00 - 2011/03/11 21:00

基準期間：2011/03/01 21:00 - 2011/03/09 21:00
比較期間：2011/03/11 18:00 - 2011/03/11 21:00

42°

GPS by the National Geographical Survey Institute



[基準：R3速報解 比較：Q3迅速解]

☆固定局：三隅 (950388)

国土地理院

[基準：R3速報解 比較：Q3迅速解]

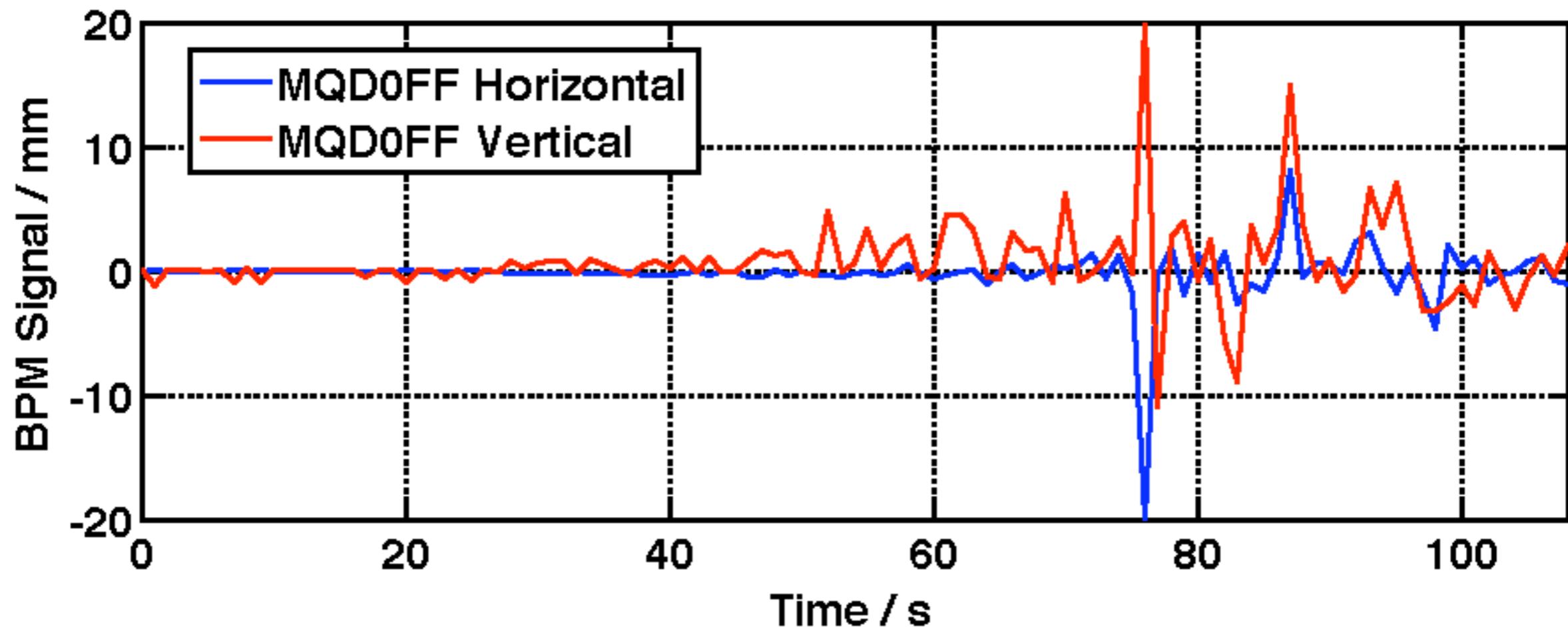
☆固定局：三隅 (950388)

国土地理院

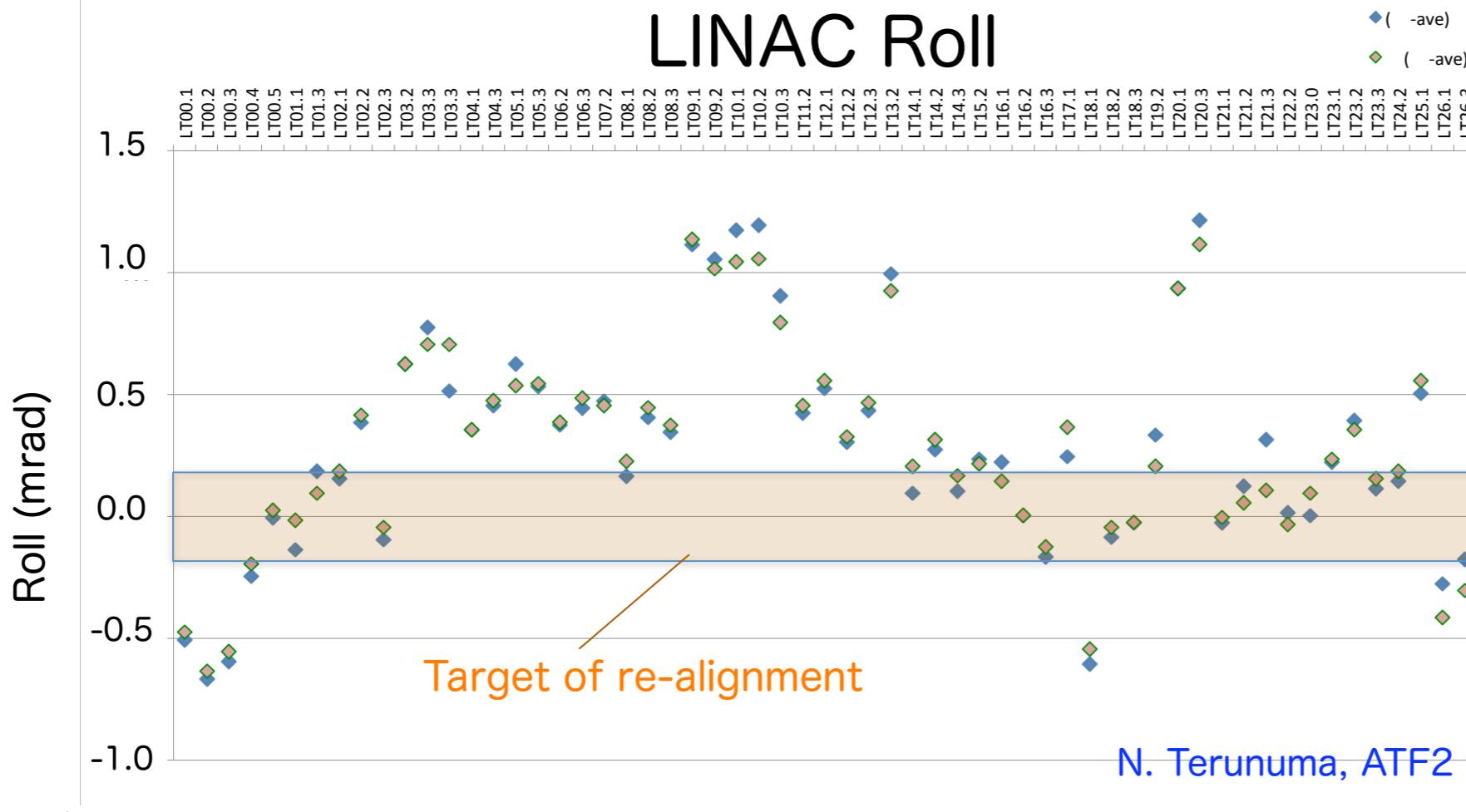
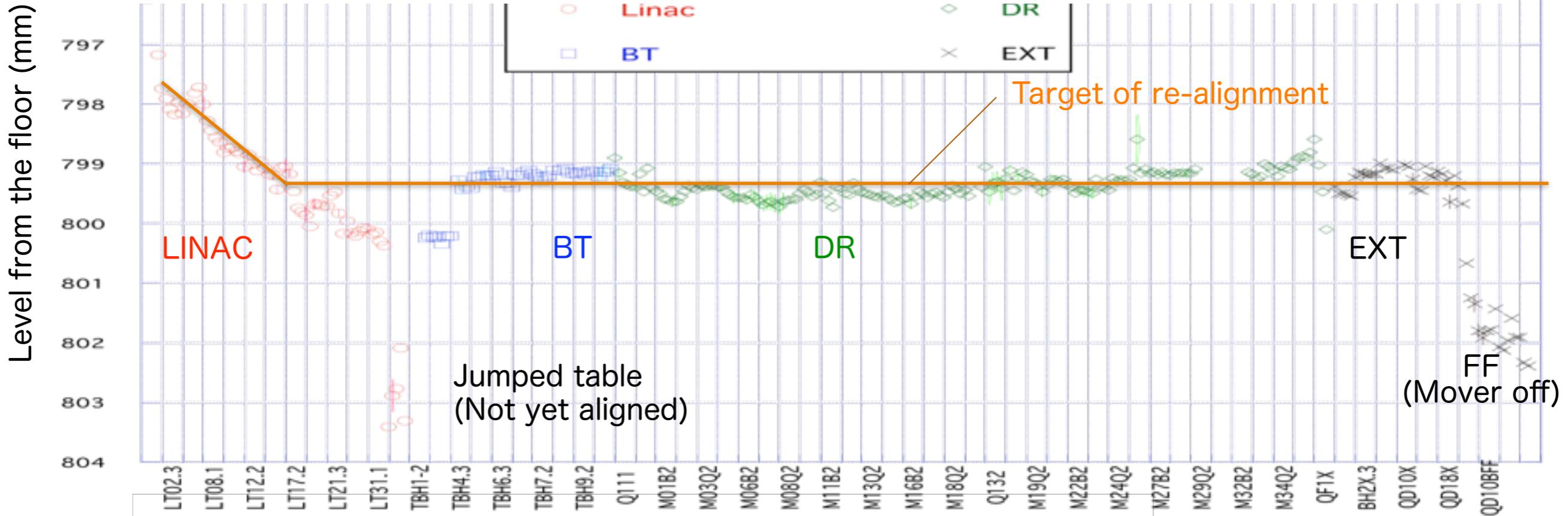
N. Terunuma, ALCPG11

We could see the earthquake effect in the BPMs.

Archived BPM readings from the last quadrupole magnet BPM in the ATF2 FFS during the Eastern Japan M9.0 earthquake, March 11, 2011, at 14:46:23 local time. Data from just before the onset of the earthquake until the beam was aborted a few seconds after is shown. KEK is about 320km from the earthquake center.



Effect on the Alignment : the beamline level



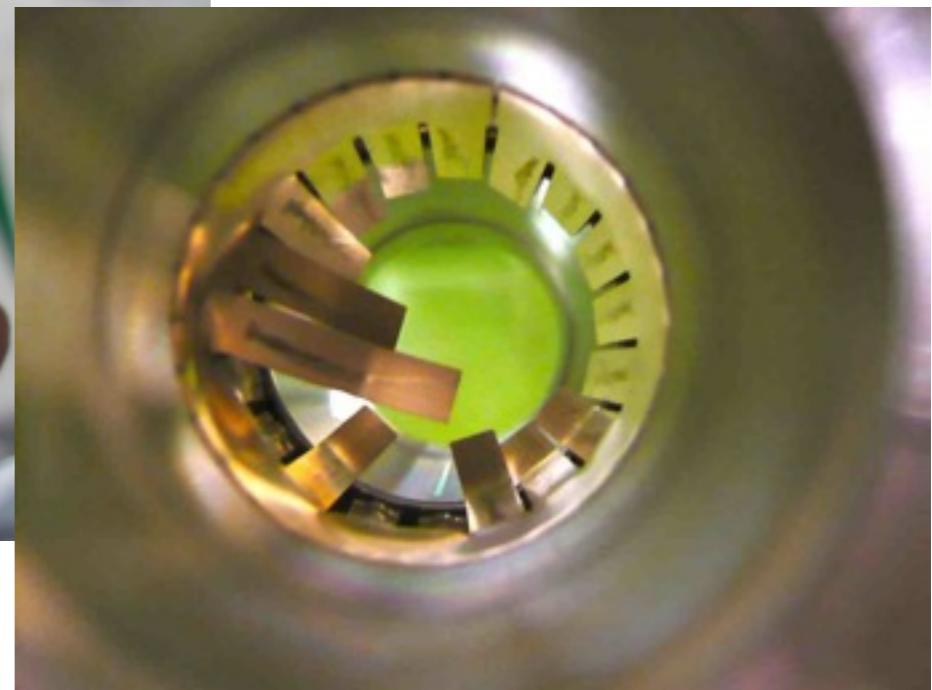
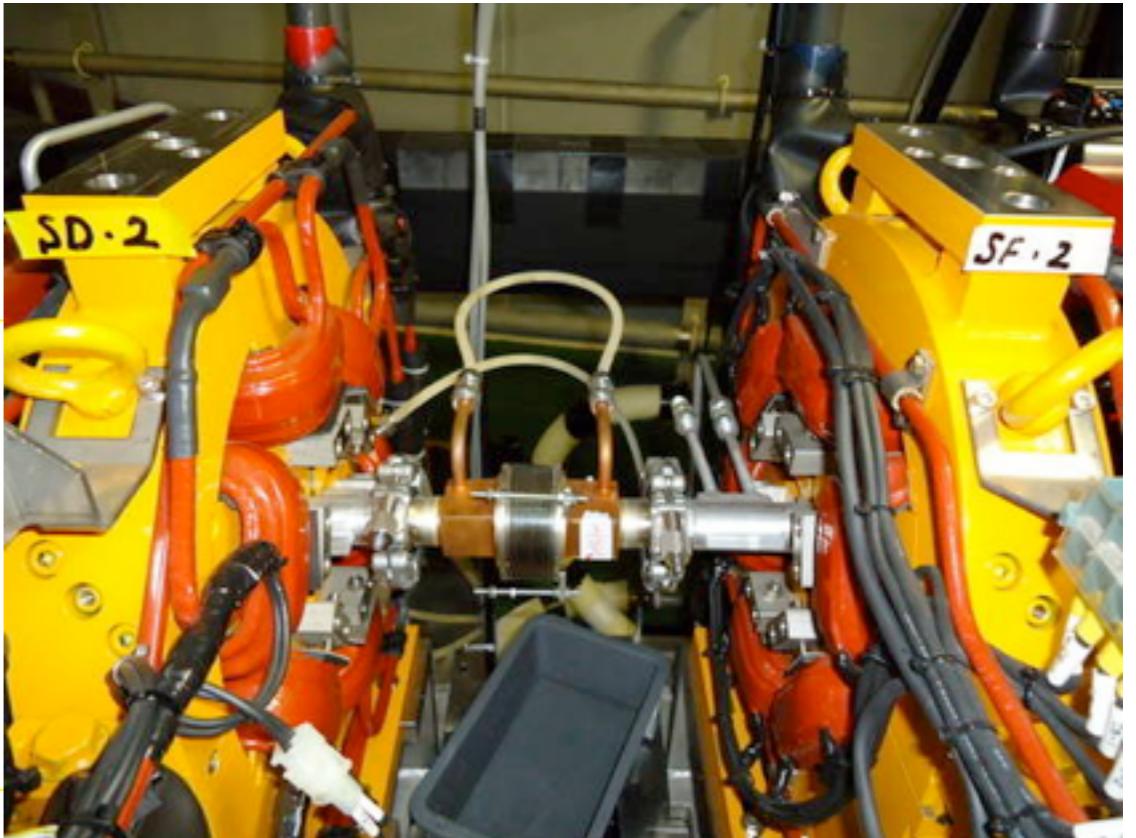
DR bellows

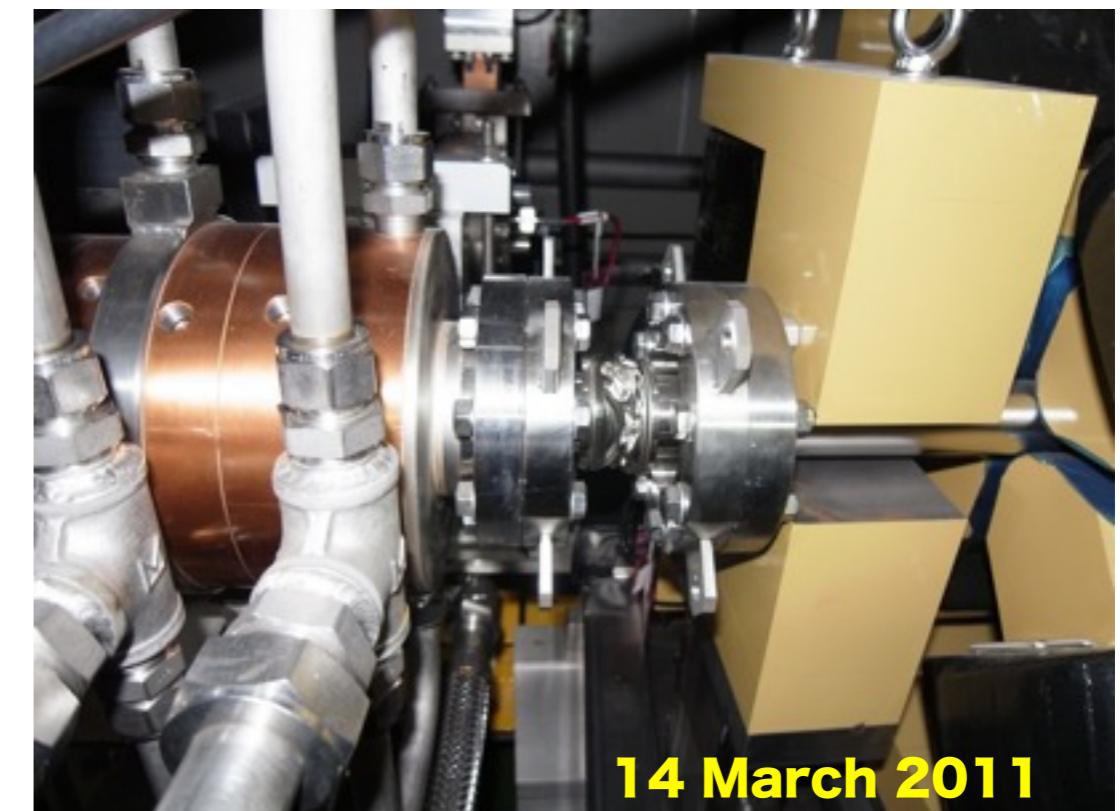
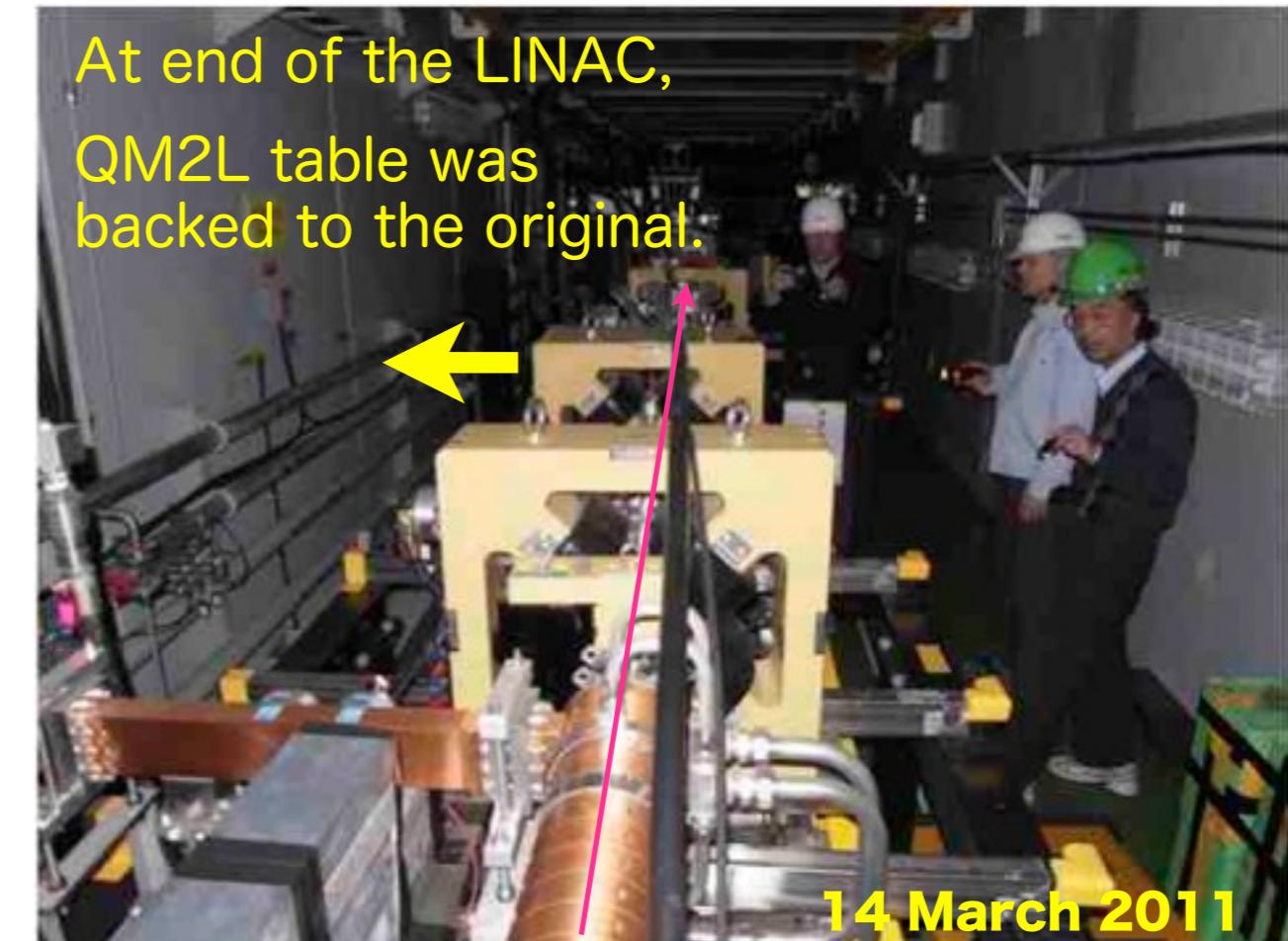
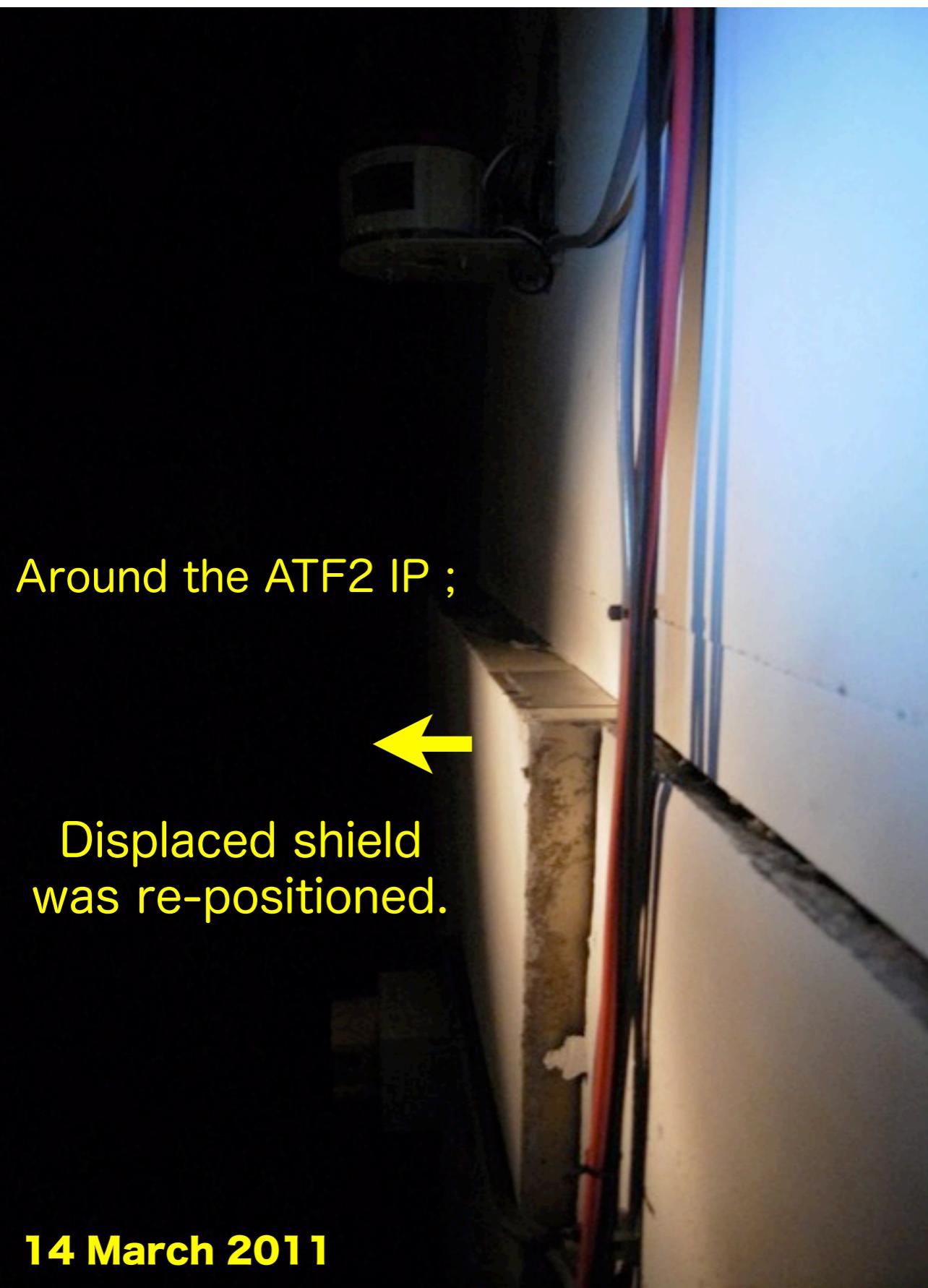
The bellows for DR has a RF shield fingers.

All bellows were checked.

Damaged bellows were repaired or exchanged.

Damaged Clamps for vacuum flanges were exchanged too.





Beam pipe was exchanged.



Wires were exchanged.

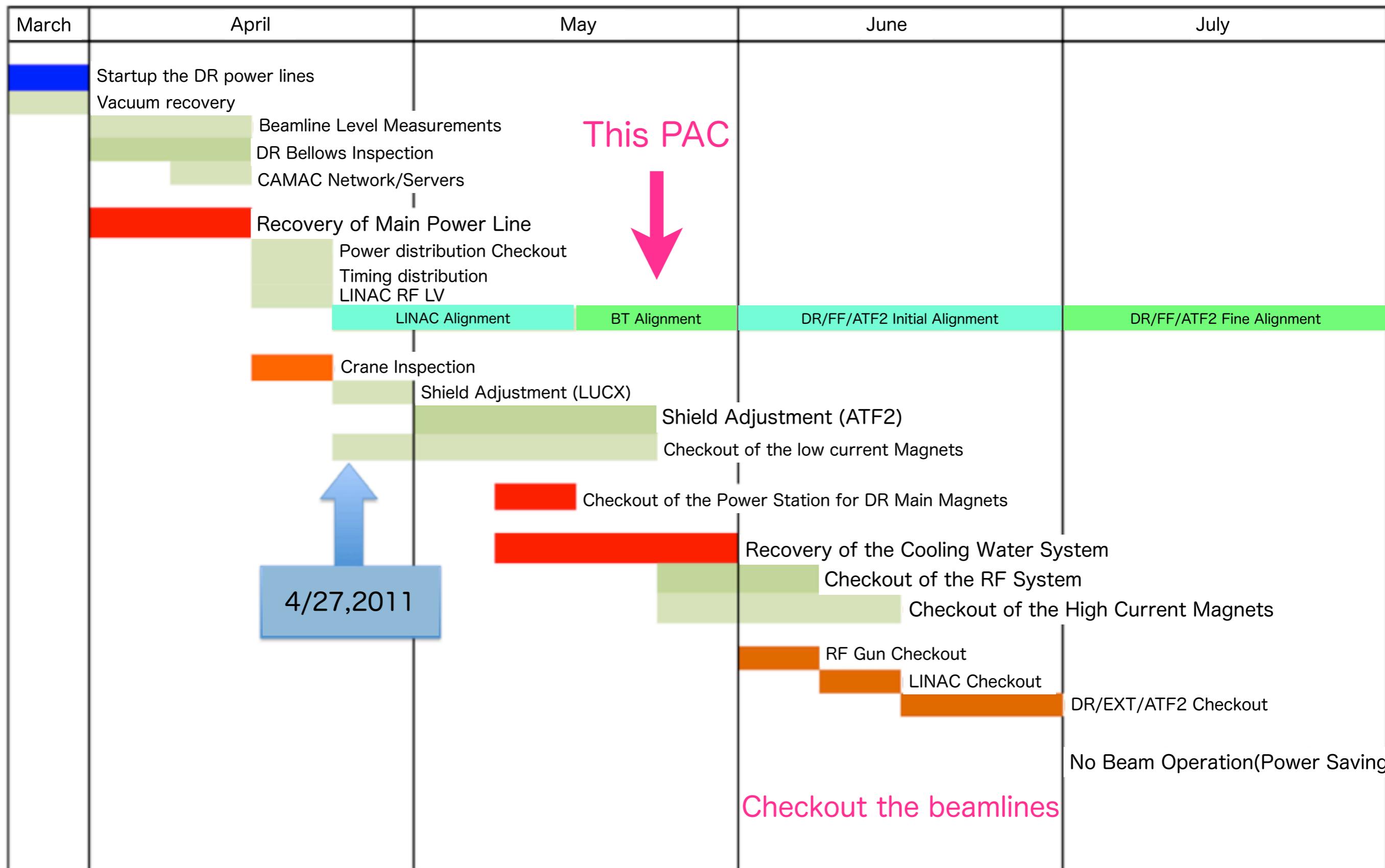
FD/IP shield works



N. Terunuma, ATF2 weekly Meeting, 11 May 2011

Recovery Plan of ATF

Ver. 2011/4/27 by N. Terunuma



ATF Future beyond JFY2012

In Feb. 2010, KEK Domestic review committee authorized by KEK directorate recommended the reconsideration of ATF international collaboration for ILC beyond JFY2012 and for new ATF international collaboration which will be started from April 2013.

Then, KEK directorate requests us to make a good proposal for the research programs beyond JFY 2012 if we want to keep our facility and activity.

Proposal of research program after JFY2013 has been discussed at the 10th and 11th ATF TB/SGC meetings, June 2010 and January 2011, respectively. The proposal will be submitted to the KEK directorates in June 2011.

Also, new MoU is needed after JFY2013 for new ATF international collaboration, while the present MoU will be extended until end of March 2013.

ATF International Collaboration

with MOU based on concurrence of participating institutes in the world
towards the International Linear Collider (ILC) project
defines the mission of ATF/ATF2

- ATF to provide a beam to ATF2
- ATF2 to achieve the two goals and
- Training of young generation for advanced accelerator technologies

concurrence by 8 institutes in Asia (Waseda U., Kyoto U., Nagoya U., KEK,
Tokyo U., Hiroshima U., IHEP, PAL)

9 institutes in EU (UCL, DESY, CERN, JAI, QMUL, RHUL,
Tomsk Pol. U., IN2P3, INFN)

4 institutes in USA (FNAL, Cornell U., LBNL, SLAC)

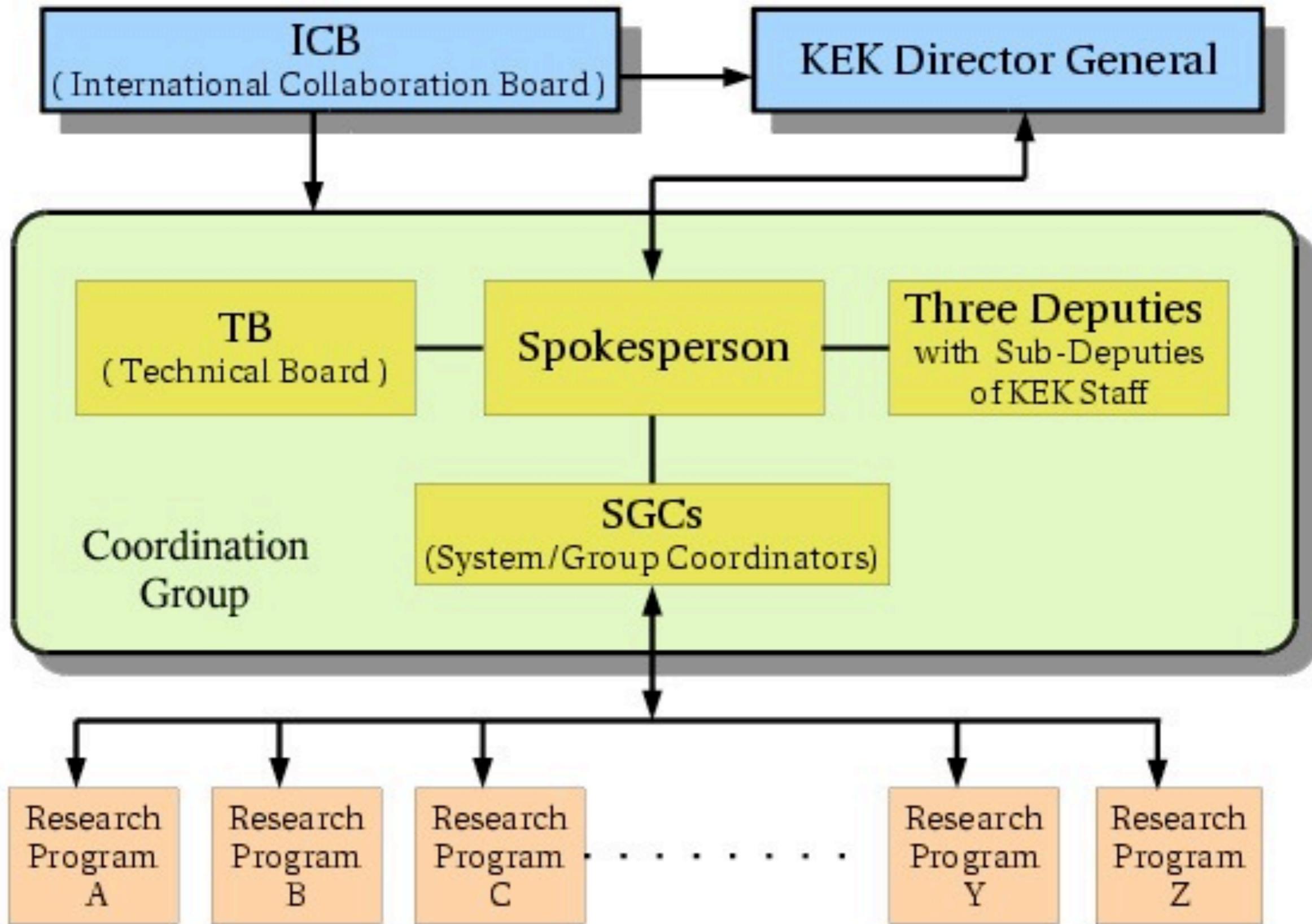
First period : August 1, 2005 - March 31, 2008

Second period : April 1, 2009 - March 31, 2011

Third period : April 1, 2011 - March 31, 2013

to be agreed by "ADDENDUM to MOU".

ATF International Collaboration



<http://atf.kek.jp/collab/ap/about/organization/index-organization.php>

Preliminary : Major Research Targets from JFY2013

1. Ultra small beam, ~ 20nm

verification of ultra low beta optics - for CLIC and also for ILC-upgrade. At the ultra low beta, the chromaticity becomes from 20,000 (ATF2-nominal) to 70,000 at CLIC. The beam size can be reduced to about 20nm with replacing the present QF1 with a SC-Q. if no SC-Q, CERN will supply a warm one. In addition, SC wigglers of CLIC prototype could be installed. Also, CERN/CLIC will supply non-linear correction magnets.

2. Nanometer scale orbit control

The 2nm stabilization at IP is needed further R&D beyond 2012, which needs three bunches at least. The present experiment (FONT5) has results of demonstrating stability from 2.1um to 0.2 um. Also, R&D of feedforward system for correction of ground motion proposed by CLIC, CERN.

3. Laser cavity for the PLC (Photon Linear Collider)

There is a 4 mirror cavity (LAL) at present, which is based on similar technique.

4. Non-linear and strong QED physics ; high field physics with collisions between the electron beam and a new 200TW laser.

Conclusions

1. Brisk recovery works by end of June, 2011
2. Preparation of improved operation
 - re-alignment of all beamlines
 - stable timing and operation (already in Feb. 2011)
 - understanding of multipole components
 - full-commissioning of IPBSM
 - etc.
3. Resume the operation in October, 2011
4. ATF plan beyond JFY2012 under preparation
 - the proposal to be submitted to KEK DG, soon.